THE BRICKBVILDER

VOLUME XXIV MAY, 1915 NUMBER 5

The Modern Schoolhouse.

V. CUBAGE AND COST.

By WALTER H. KILHAM.

IN computing the probable cost of a schoolhouse project the apparent simplicity of the type of building should not delude the architect into the belief that a general rule for offhand estimating can be given and adhered to.

The Boston Schoolhouse Commission some years ago adopted a rule by which it could judge of the efficiency of any floor plan laid before it for consideration. It was that the total area of the building on each floor should not exceed twice the total area of the class rooms on that floor measured inside the walls. In case an assembly hall existed, it could be counted as two class rooms in a "small" building and four in a "large" one, the actual meanings of "small" and "large" not being clearly defined, except that a building of over sixteen class rooms was "large." 28,000 cubic feet was allowed per class room for the lower elementary and 30,000 cubic feet for upper elementary, with allowances for assembly halls as above. The scheme worked fairly well for the Boston type of school, having separate wardrobes and small room sizes, and it had a distinct value in standardizing the prevailing diffuse methods of schoolhouse design. It was not applicable to high schools or to many suburban buildings where especially large halls were desired for civic or neighborhood uses.

In connection with any scheme of comparing costs, the method of cubing naturally plays a very important part. It is generally customary to take the cube from the basement floor level to the mean level of the various roofs; but this apparently simple proposition is susceptible of many forms of manipulation, according to whether the figures are intended for public or private use. In a recent competition the program limited the cube of the proposed building to a certain figure. This was easily fulfilled in the winning design by not indicating any cellar under the large assembly hall and counting the cube from that floor. The cost of filling to support this floor had to be assumed by the city after the work was started. In another competition the cubage was limited and stipulated to be counted from the cellar bottom to the outside of the roof. The plans conformed to this requirement, but the imposing exterior effect was gained by carrying up the walls 12 feet above the roof, involving a cost above that contemplated.

The regular practising architect who does not concern himself with the flummery of competitions, whether or not of the "approved" variety, fails to be interested in such manipulations of the cubage of the building, and equally he will avoid making himself a slave of cubic feet. The general public frequently becomes hopelessly confused between cost per cubic foot and cost per pupil, and it is evident that the relation between these two factors may vary widely; for a building on account of having, for example, a very high roof with a large amount of attic space, may show a low cost per cubic foot and at the same time a high cost per pupil. As stated above, the customary way is to calculate cubage from cellar floor to mean height of the roofs, and this certainly represents the contractor's view of how much building he has to construct. The Germans, however, regard the cost of a building as the cost of the utilizable space that the occupant really gets, that is, the cost of the contents included between the cellar floor and the ceiling of the topmost story. An elaborate form for compiling statistics of cost was formulated by a convention of city building officials of the German Empire, and all German

School Borough Year

Total Accom. Cu. Contents Cu. ft. Area Typ. fl. sq. ft. No. C. R. Units

Various Contracts	Contract Price	Per Cent. Total Cost	Cost per Cu. ft.	Cost per Pupil	Cost per Unit
Building,					
Sanitary,					
Heating { Item 1, Item 2,					
Electric,					
Furniture, exclusive of Gymnasium,					
Furniture of Gymnasium,					
Lab. Equipment,					
Mech. Equipment,					
Organ,					
Elevators,					
	$		$	$	$

REMARKS:

Record Cost Card in use by the Superintendent of School Buildings, New York City. Size of Card Is 5 by 8 Inches

cities were requested to use the uniform method of computation in figuring school building costs. This system is too lengthy for reproduction here, and it is evident that it is not exactly applicable to American uses.

A more interesting method of standardizing schoolhouse cost has been devised by Mr. C. J. B. Snyder of New York* and is reproduced herewith by his permission:

(A) *Cubic Content.* This shall be understood to be the product of the following:

1. The area of the ground space occupied by various portions of the building measured to the outside of foundation walls, by
2. The height of these portions measured from the lowest floor level to the average roof level of same.
3. This shall include all covered or enclosed stoops, steps, or entrances; chimneys to roof level, etc. There shall be excluded areas; vaults; coal slides; underground ducts; open stoops, steps, or entrances, etc.

(B) *Total Building Cost.* This shall include:

1. Construction, including excavation, fill, grading sidewalk and yard pavements, planting, seeding, retaining walls, fences, curbs, in fact, all items not otherwise specified, provided for or logically belonging with items in (2) plumbing; (3) heating and ventilation; (4) mechanical equipment; (5) electric work; (6) furniture; (7) gymnasium equipment, as a completed structure.
2. Plumbing, gas, and drainage, including connections with street mains (where sewers and mains occur in the streets upon which the property is located).
3. Heating and ventilation, including all automatic control, air conditioning apparatus, and electric drive, when used for any purpose in connection with the plant.
4. Mechanical equipment for shops, also freight and passenger elevators.
5. Electric work, including all bell and gong control and interior telephones; lighting fixtures; generating plant and all motors or appliances not included in (3).
6. Furniture, including everything for the operation of the school, except (7).
7. Gymnasium equipment.

NOTE. — The cost of site and of architect's and engineer's services are not to be included in any of the factors.

(C) *Abnormal Cost.* This shall include:

1. All earth or rock excavation, piling, concreting mason work, grillage, waterproofing, drains, etc., in excess of that required for the building under normal conditions, *i.e.*, resting upon firm, dry earth.
2. Areas, open or covered.
3. Vaults and coal slides.
4. Underground ducts or passages.
5. Excavation, fill, grading, or retaining walls, in excess of that required for the building on a site where the surface of ground is practically level and even with the street grades.
6. Roof playgrounds.
7. Additional cost of plumbing, gas and water work due to absence of sewers and mains in the streets adjoining property.
8. Swimming pool and accessories.

(D) *Normal Cost.* This shall mean the theoretical cost of the building, supposing all conditions of site, soil, and surroundings to be normal. This will be found by

$$B - C = D,$$

and will afford the basis for comparison of cost, one building with another.

(E) *Area Typical Floor.* This shall be computed at the level of the floor above the auditorium and shall include the outside walls.

(F) *Total Class Room Area.* This shall be understood to mean the sum of the floor areas of all schoolrooms to be occupied by what are considered pure classes, *i.e.*, all rooms in which teachers are stationed for purposes of instructing pupils who may be assigned thereto. These shall be measured within the walls.

(G) *Auxiliary Room Area.* This shall be understood to mean the sum of all the floor areas within the building for the use of the principal, teachers, and pupils, including all floor areas of intermediate stories or parts thereof, exclusive of those provided for in (F).

(H) *Class Room Area, Typical Floor.* This shall mean the sum of the floor areas of the pure class rooms on the floor above the auditorium, from which floor (E) is computed.

(I) *Number of Class Rooms.* This shall mean the total number of rooms to be occupied by pure classes, as defined in (F).

(K) *Pupil Capacity.* This shall mean the total number of pupils accommodated when all pure class rooms are fully equipped.

(L) *Cost per Class Room* (Pure) will be:

$$L = \frac{B \text{ (total building cost)},}{I \text{ (number of class rooms)},}$$

(M) *Per Capita Cost* (Total).

$$M = \frac{B \text{ (total building cost)},}{K \text{ (pupil capacity)},}$$

(N) *Per Capita Cost* (Normal).

$$N = \frac{D \text{ (normal building cost)},}{K \text{ (pupil capacity)},}$$

being the real basis for comparison of per capita costs, one building with another.

(O) *Per Capita Cost* (Abnormal).

$$O = \frac{C \text{ (abnormal cost)},}{K \text{ (pupil capacity)},}$$

being the *per capita* cost due to abnormal conditions of site, surroundings, soil, etc.

(P) *Cost per Cubic Foot* (Total).

$$P = \frac{B \text{ (total cost)},}{A \text{ (cubic contents)},}$$

(Q) *Cost per Cubic Foot* (Normal).

$$Q = \frac{D \text{ (normal cost)},}{A \text{ (cubic contents)},}$$

*Report of Superintendent of School Buildings. New York. 1913.

being the real basis for comparison of cubic foot costs, one building with another, when costs of labor and materials; the type of building, whether frame, brick, fireproof, etc.; kind of materials used, etc., are substantially the same.

(R) *Cost per Cubic Foot* (Abnormal).

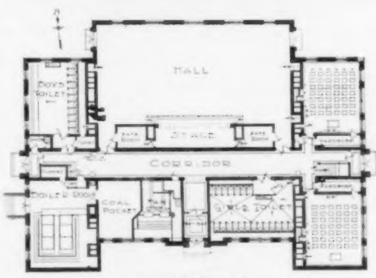
$$R = \frac{C \text{ (abnormal cost)},}{A \text{ (cubic contents)},}$$

being the cubic foot cost due to abnormal conditions of site, surrounding, soil, etc.

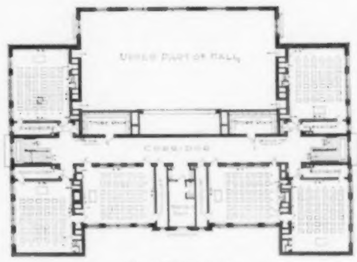
(S) *Ratio of Effective Teaching Space to Total Floor Area.*

$$S = \frac{H \text{ (classroom area, typical floor)},}{E \text{ (total areas, typical floor)},}$$

being the real basis of comparison as to economy of planning one building with another.



Ground Floor Plan



First Floor Plan

Hopewell School, Taunton, Mass.

Kilham & Hopkins, Architects

Cost — 18½ cents per cubic foot; $129 per pupil. Second class construction, stairways and all walls and partitions fireproof

Other information could be obtained, but it is thought that sufficient has been given to cover the essentials in obtaining true comparative data, exclusive of the consideration which must be given to materials and local conditions.

In calculating the probable cost of a building from a set of plans, the cubic foot route is the most reliable, but as a committee man recently said to the writer, "Pupils are your product, and a factory ought to know what its overhead cost of production is." In elementary schools the cost per pupil is comparatively easy to estimate; but in high schools reliable statistics are difficult to compile on account of variation in program, variation in number of departments and accessory rooms, and different ideas in various cities regarding laboratories, gymnasiums, wardrobes, and fixed equipment in general. For example, one city may regard a high school as incomplete unless equipped with a swimming pool and a $10,000.00 organ; while another regards any gymnasium at all as a luxury and cuts down the assembly hall to accommodate half the enrolment of the school.

An elementary school consists practically entirely of "home" rooms, excluding perhaps the two departments of domestic science and manual training; a high school may have a certain number of so-called "home" rooms, some additional "recitation" rooms, and a large number of laboratories and special departments, varying according to the ideas of the local Board of Education. It seems fair, therefore, to figure the cost per pupil of any building on the actual total number of seats or places in all class, study rooms, and laboratories, but not counting the assembly hall. Mr. C. J. B. Snyder writes as follows regarding this: "The difficulty I have experienced in obtaining actual figures as the accommodation to be afforded by a high school building is due entirely to

(a) Variation in programs,

(b) Number and grade of students with relation to

(c) Number of class rooms, study rooms, laboratories, libraries, and other special rooms, and

(d) A rule which will apply to a classical high school will not, in any sense, apply to one devoted to manual training or any special purpose.

"As a business proposition there should be such a relation between (a) the program, (b) the number of students, and (c) the number of class rooms, that they shall be all occupied for each period of the day on the single session plan."

The high cost per pupil of many high schools is due to the practice of maintaining "home rooms" where each pupil has his headquarters, leaving his seat empty when he goes to special work in the laboratory or elsewhere. If, on the contrary, every room is made to do duty continuously for recitation purposes, a considerable saving can be made in the cost of the building. Some cities, Philadelphia for example, utilize the assembly hall as a study hall. On every third seat there is arranged an arm table made to hinge down when not in use. The division assigned to the hall for its study hour takes its place in the chairs having these tables which are sufficiently separated to avoid interference.

Figured on the above basis, the DeWitt Clinton High School in New York cost about $300.00 per pupil; the Washington Irving High School, about $375.00 to $400.00; the Boston High School of Commerce, about $292.00; the Haverhill (Mass.) High School, $225.00; the Salem (Mass.) High School, about $230.00, and so on. Elementary schools in the city of Boston of fireproof construction should theoretically cost about $140.00 per pupil; those of second-class construction in the suburbs from $110.00

to $130.00, with of course a wide range of variations for local conditions which vary from the standard.

While it is true that calculations of the costs of elementary schools are much simpler to compile than those of high schools, there is still room for wide variation in figures on the question of what the actual capacity of the school is; for the rooms may be under occupied in some cases and overcrowded in others. Mr. H. L. Patterson, of the Boston Schoolhouse Department, considers that the only fair way to estimate the capacity of an elementary school is to figure the total number of square feet in all pure class rooms and divide by fifteen, the result being the pupil capacity of the building. The following table of costs of Boston schools was compiled by Mr. Patterson on the above basis and is reproduced herewith by permission. It will be seen that the figures vary from those in previous reports.

FIRST CLASS.

Name.	No. of Rooms.	No. of Pupils.	Cost of Building.	Cost Per Pupil.	Cost Per Cu. Ft.
Wm. E. Russell	18	976	$188,524.56	$192.14	$0.21
Jefferson	19	1,038	210,890.49	203.17	.24
Washington	30	1,560	325,541.60	208.68	.25
O. H. Perry	14	770	146,145.63	189.80	.24
Mather	30	1,650	289,332.99	175.36	.21
Thomas Gardner	14	770	140,267.57	182.17	.19
Oliver W. Holmes	24	1,224	195,648.02	159.84	.20
Dearborn	21	1,110	217,131.32	195.61	.22
Patrick A. Collins	17	904	176,663.79	195.42	.23
Edward Everett	14	614	107,515.43	175.17	.21
John Cheverus	16	704	102,706.35	145.89	.19
Abraham Lincoln	40	1,820	280,088.43	153.89	.24
Samuel Adams	14	632	107,518.34	170.12	.22

SECOND CLASS.

Name.	No. of Rooms.	No. of Pupils.	Cost of Building.	Cost Per Pupil.	Cost Per Cu. Ft.
John Winthrop	16	724	$110,673.54	$152.86	$0.18
E. P. Tileston	16	724	132,506.39	183.02	.26
U. S. Grant	18	822	116,509.09	141.74	.19
Lewis	17	778	108,090.29	138.93	.17

Average on the above thirteen buildings first class, cost per pupil, $180.56; cost per cubic foot, 22 cents. On the four buildings of the second-class construction the cost per pupil, $154.14; cost per cubic foot, 20 cents. Percentage saved on second-class buildings over first-class in cost per pupil, 14.06 per cent; percentage saved on second-class buildings over first in cost per cubic foot, 9 per cent.

In the above comparison four second-class buildings, have been compared with thirteen first-class buildings, which is hardly fair. The following table shows four first- and four second-class buildings for comparison:

FIRST CLASS.

Name.	No. of Rooms.	No. of Pupils.	Cost of Building.	Cost Per Pupil.	Cost Per Cu. Ft.
Edward Everett	14	614	$107,515.43	$175.17	$0.21
John Cheverus	16	704	102,706.35	145.89	.19
Abraham Lincoln	40	1,820	280,088.43	153.89	.24
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E. P. Tileston	16	724	132,506.39	183.02	.26
U. S. Grant	18	822	116,509.09	141.74	.19
Lewis	17	778	108,090.29	138.93	.17

Percentage saved on second-class buildings over first in cost per pupil, 4 per cent; percentage saved on second-class buildings over first in cost per cubic foot, 7 per cent.

Following is a comparison of lower elementary school of the first- and second-class construction:

FIRST CLASS.

Name.	No. of Rooms.	No. of Pupils.	Cost of Building.	Cost Per Pupil.	Cost Per Cu. Ft.
Marshall	12	758	$124,467.65	$164.20	$0.24
Farragut	14	714	150,526.43	210.82	.23
Paul Jones	11	643	114,370.33	177.87	.22
Ellis Mendell	12	612	122,267.20	199.78	.24
Christopher Columbus	24	1,110	173,512.08	156.32	.23
J. B. O'Reilly	14	672	112,839.00	167.91	.25
Samuel W. Mason	14	644	118,324.64	183.73	.27
John G. Whittier	10	478	74,736.15	156.35	.23
James Otis	12	612	107,818.00	174.54	.26
Joseph Tuckerman	10	480	77,423.25	161.30	.23
Sarah J. Baker	24	1,152	161,194.23	139.92	.23
Wm. E. Endicott	10	476	79,057.77	166.09	.23
Nathaniel Hawthorne	9	447	67,912.07	151.93	.24
Nathan Hale	12	480	67,231.82	140.08	.20
Peter Faneuil	17	760	108,079.50	142.21	.25
Wm. L. Garrison	10	460	66,151.48	143.81	.24
Lafayette	8	352	62,804.25	178.42	.28

SECOND CLASS.

Name.	No. of Rooms.	No. of Pupils.	Cost of Building.	Cost Per Pupil.	Cost Per Cu. Ft.
John L. Motley	4	172	$22,510.25	$130.87	$0.23
Charles Bulfinch	10	538	78,925.73	146.59	.22
George T. Angell	8	352	55,154.50	156.69	.26
Benedict Fenwick	12	547	62,881.45	114.96	.19
Wm. Bradford	8	372	42,714.04	114.82	.17
Ellen H. Richards	8	366	44,589.76	121.83	.19
Mozart	4	148	22,891.00	154.67	.21
Martha Baker	4	160	24,557.91	153.49	.19
John J. Williams	12	495	69,138.44	139.67	.23
John D. Philbrick	8	333	59,663.75	179.17	.19
Philip Sheridan	12	495	70,735.20	142.89	.21
Florence Nightingale	10	391	60,414.14	154.51	.22

Percentage saved on second-class buildings over first-class in cost per pupil, 3.09 per cent. Percentage saved in second-class buildings over first-class in cost per cubic foot, 8.333 per cent.

It is difficult to explain the high cost of some of these buildings of second-class construction, particularly as many attempts at economy were introduced. A building of second-class construction in the vicinity of Boston can generally be produced of the highest type of material throughout for from 18½ to 19 cents per cubic foot, and these figures can be reduced in most other localities.

Mr. Ernest F. Guilbert of Newark (Report for 1913–14) gives the average cost of twenty elementary schools in that city, all of fireproof construction and all having an auditorium and gymnasium, except three, where a combination room serves both purposes, at $147.00 per pupil, based on the New Jersey law of 18 square feet per pupil. This result would be lower still if based on the ordinary rule of 15 square feet. These buildings are all well appointed and of unusually attractive exterior appearance.

While the cost per cubic foot remains the safest method for the architect to use in estimating from the plans the probable cost of a new building, there is always danger that he will, in his desire to reduce cubage, so cut down and restrict the accommodations as to seriously hamper the use of the building without any corresponding gain in cost, and great care should always be taken in the designing stage to see that no advantage is thrown away in the desire to keep down to a limit of cubature.

Stairways in Houses of Moderate Cost.

I. THE HISTORY OF THE DOMESTIC STAIR.

Accompanied by Examples Selected from Recent Domestic Work.

By JOHN T. FALLON.

DURING all the vicissitudes of developing growth through which the planning of the house has passed, the prime importance of the stairs has remained comparatively unchanged. We are accustomed to think of domestic planning in its modern sense to have commenced somewhere in the eleventh century and to have settled down to a steady and consistent growth after the life of society was freed of the necessity for protection and was able to consider its habitations from the standpoint of ease of living. The persistence of tradition in architecture long after actual causes or necessities are removed, a phenomenon that has been pointed out by Viollet-le-Duc in his dictionary of architecture, acted to postpone the realization of conditions of comparative comfort until at least four centuries later. This tendency to cling to obsolete ideas in art becomes the means of explanation of many otherwise unsolvable questions in the history of house planning and one that shall be referred to later on.

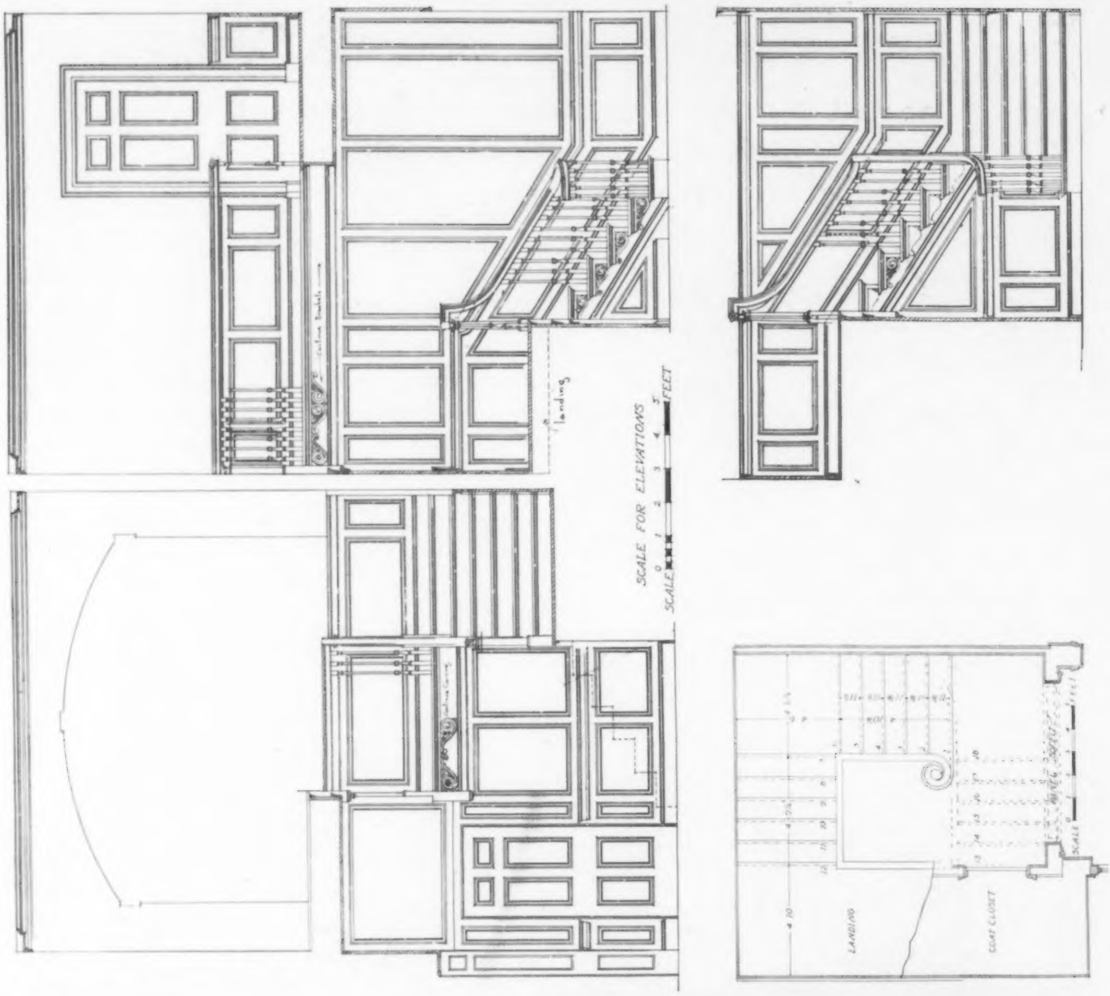
The stairway, performing a continuous and important function and being the key to the planning of the house, plays a most prominent part in domestic architecture. The problems of affording an easy ascent, of being conveniently related to the body of the house, and of receiving a dignified and suitable treatment have been constant and unchanged. The variety of solutions has depended upon the growth and development of social life and upon differences in the customs and climate of the respective countries. No little importance attaches itself to the various materials most accessible to the builders.

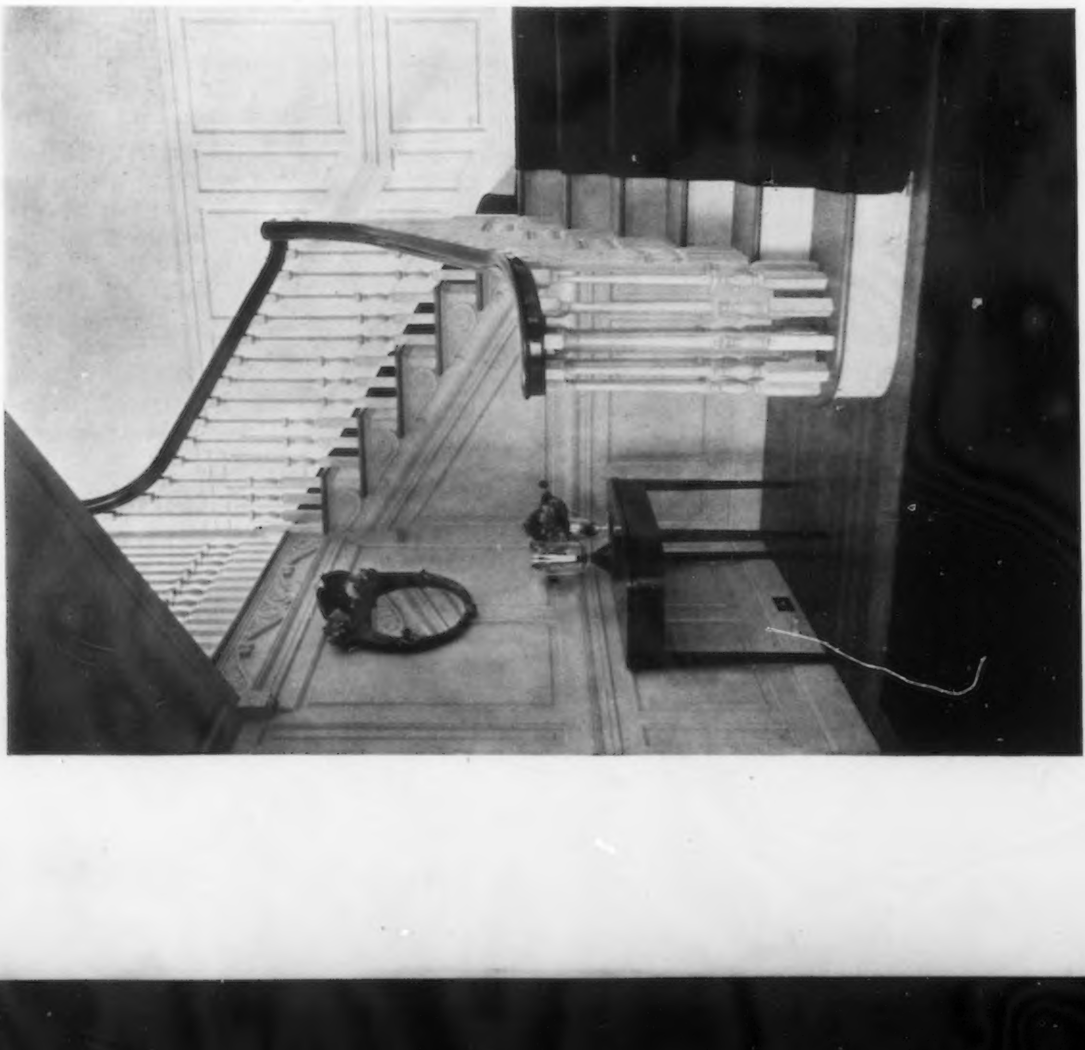
In Gwilt's "Encyclopedia of Architecture" the staircase is defined as "that part or subdivision of a building containing the stairs which enable people to ascend or descend from one floor to another." Accepting this technical description, it is evident that the staircase is distinct from the hall, commonly known as the entrance hall from its position nearest the entrance, and this difference continued to be preserved in all continental planning until the beginning of the past century. A lax nomenclature has crept into the English language and these two distinctive features have been confused, so that we continually speak of the staircase as the hall or even of the staircase hall. Modern planning has ceased to preserve this distinction, but for the purposes of historical discussion it must be kept in mind.

It was in Italy that the staircase first received attention as a feature in the general composition of the house. The domestic life of the upper classes having developed in the security of the towns enclosed with walls, house planning became naturally less irregular and more regard was given to comfort and dignity. In Italian palaces, until the end of the fifteenth century, the usual way of building the stairs was to start them near the vaulted entrance way and to carry them up in straight flights between walls. With the advent of Palladian ideas, the staircase assumed more imposing proportions, although it was not until much later that the monumental staircase as one of the chief features of the Italian Renaissance began to be built. Indeed, until late in the seventeenth century, intra-mural stairs were considered grand enough for the most splendid palace.

The spiral staircase, soon discarded by the Italian architects, was left for the French to develop, and as Wharton and Codman have suggested in their admirable book, its structural difficulties must have had an especial fascination for the ingenuity of the Gallic mind. No doubt, it was one of the motives of Gothic house planning so tenaciously clung to by the French aristocracy long after they became familiar with the simpler and more logical Italian methods. After their full assimilation, the

Stairway in an Old House, Philadelphia, Pa.





STAIRWAY IN THE HOUSE OF HARRY W. HARRISON, ESQ., DEVON, PA.

DUHRING, OKIE & ZIEGLER, ARCHITECTS

French stairway came in line with the national art development and in the various periods was interpreted in the most elegant and graceful manner. In Italy, stairs were usually of stone, wood being little used in interior architecture; as we have observed, the stairs instead of being placed between walls were often carried up in an open staircase. In contrast to the French custom, the balustrades were usually stone or marble. The medieval French stair was usually of wood — a material that was soon abandoned for stone. Beginning with Louis XIV, the stone stair with decorative iron railing becomes a distinctive feature of French houses. Since the eighteenth century, French architects have spent their talents upon the beautiful wrought iron stair rails which decorate almost every domestic interior in France.

The distinction between hall and staircase was never observed as clearly in England as it was on the continent. The Tudor hall with its screened end separating it from the staircase was followed by the Renaissance hall, in which an open arcade was substituted for the screen. Different habits of living tended also to unite the two features; for, unlike the continental dwelling, the Englishman's home is his castle and the stairs become more intimately associated with the family life, with less need to shut them off from the other rooms. The vestibule never formed part of the English house and the hall, in medieval days the center of feudal life, refused to shake off entirely this function.

The natural tendency in the architecture of the American colonies was to borrow its ideas of planning from the modest houses of the middle class where the confusion of the two features was apt to be most prevalent, and all our later traditions have helped rather than hindered this development. Privacy in domestic planning is not nearly as sought for here as it is in Europe; in our house planning, little attempt is made to separate the life of the occupants from the intrusion of strangers. We show this in our entrance doors of plate glass, in our abhorrence of fences, and in many other ways, preferring to invite rather than to repel attention. That there will soon be a reactionary swing of the pendulum is certain, if one may deduce the general tendency from specific and isolated examples.

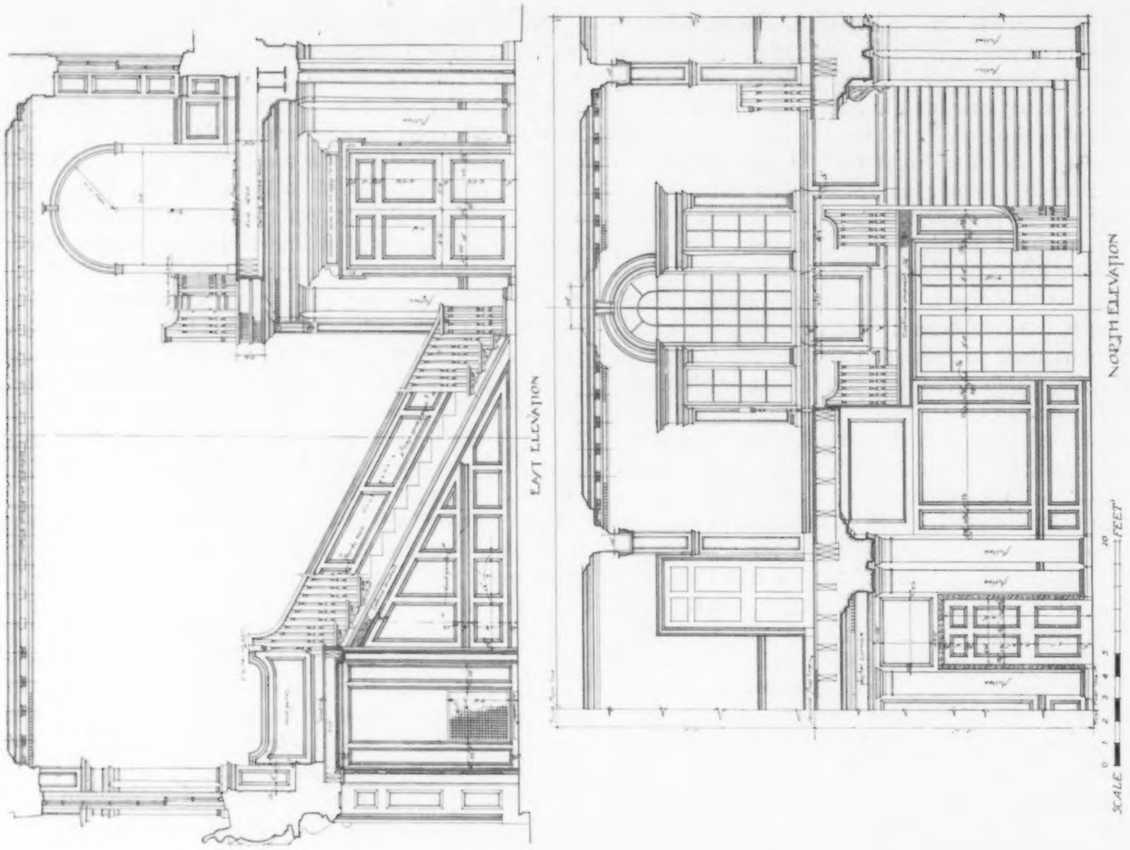
In England, wooden stair rails were greatly used during the Tudor period, marked by elaborate detail rather than by great merit of design. Their charm for us probably lies as much or more in their quaintness and patina of age as in their intrinsic worth. The introduction of Italian motives brought the classic stair of stone, which was copied in smaller houses in wood. Iron rails were little used in England, where the influence of the joiner and carver was so strong towards the use of the more tractable material. The Anglo-Saxon skill and ingenuity in wood working is perhaps more of a factor in our Colonial architecture than is generally realized. It is certainly one of our important inheritances from the mother country, since not only were the traditions bodily transplanted, but the actual workmen themselves must have been here at most but a generation or two.

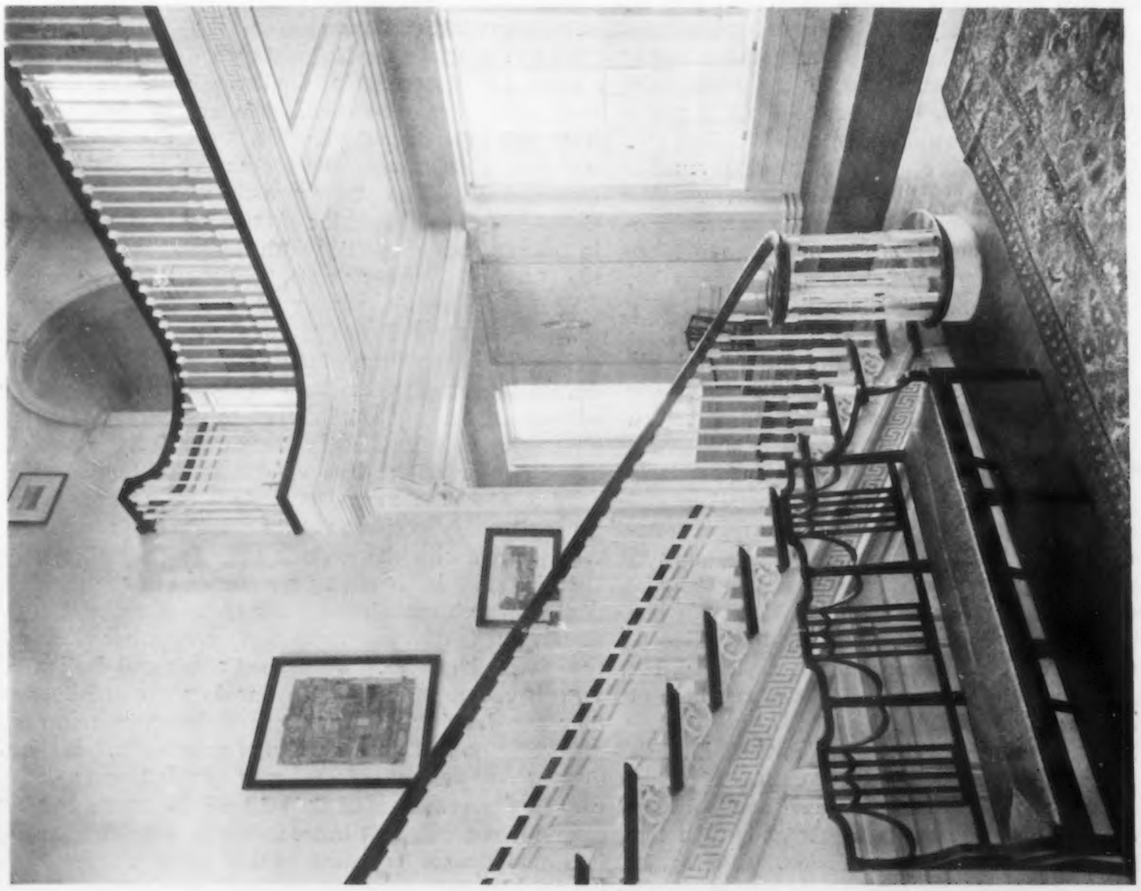
Let us now have a more detailed glance at the English stair during the early part of the eighteenth century, — the pre-Revolutionary period when intercourse between America and England was at its height and when the style was in the real process of transfusion. Godfrey, in "The English Staircase," says, "The extreme and somewhat constrained intellectuality of the Georgian era, mirrored so faithfully in the quality of its furniture, made chiefly for that elusive quality known as elegance. We have already seen the exuberance of the early Renaissance restrained by the desire for the correct classic forms which obtained from Charles II to Queen Anne. But the very essence of the staircase was now to be materialized and expressed in the simplest lines. It was to be a flight of steps in one continuous curve from floor to floor and to effect this the covering string must be abolished, the heavy handrail must give place to a light and polished roll, and the newel — in order that it may not obstruct the essential line — must become little more than a slightly accentuated baluster. This ideal was not completely reached until the finest examples of iron balustrades were introduced in the later years of the century; but every alteration that occurred was with this object in view."

The first step in this development was the suppression of the closed string, the stairs being brought out over a small constructional string. The stair ends were then decorated with consoles, which became in their richly carved forms the great feature of the Georgian stair. The balusters became slighter and great ingenuity was spent upon their design. From two to three balusters were used to each tread, usually with alternate designs, the favorite type being one with a hollow groove worked spirally around the shaft, another with vertical flutings, and a third the ordinary turned type. A distinctive Georgian feature was the small, square block introduced just below the shaft. The start of the stairs began with a sweeping curve around which the handrail and baluster swept to meet a small, central newel.

In a later article the Colonial type of stairs will be discussed and its points of similarity with the Georgian designs of England shown. We are chiefly concerned here with indicating the English development during this period as a basis for showing how much more closely this feature followed its prototypes than other parts of the Colonial house. One index of the effect of the Revolution in lessening our connection with England is illustrated by the fact that iron stair rails, which start to appear in England in the last quarter of the eighteenth century, were practically unknown in America.

The Colonial stairway has naturally had a lasting influence in America, due both to the patriotic support of our one national style and also to its practical and simple elements. It is fortunate in many ways that the type was adopted at one of the high-water marks of English architecture, since no forms have since been developed in England which approach the Georgian type in grace and ease. Even with the modern taste for eclecticism, the Colonial stair is so strongly embedded in the minds of American architects that it not only has a national application, but it colors and modifies every other European type that is imported. While the French and Italian designs have a restricted use in our domestic architecture, they are drawing the attention of designers towards a more elegant and classical form of expression. It is safe to say that the house of moderate cost will never depart very far from the lines of Colonial development; but it is certain that continental influences will more largely enter into and influence its growth as time goes on.





STAIRWAY IN THE PRINCETON CHARTER CLUB, PRINCETON, N. J.
MELLOR & MEIGS, ARCHITECTS

Plumbing Installation and Sewage Disposal.

II. TRAPS, FIXTURES, AND WATER SUPPLY.

By CHARLES A. WHITTEMORE.

THE reasons for installing vents in connection with traps is sufficiently obvious. Occasions will arise, however, when the vent installation is inadvisable because of difficulties in prearranging a definite location. For example, many times in large office buildings the floor space is left undivided until such time as the tenancy is determined. Frequently it may not be decided until the floors have been set in place and the "roughing-in" of the plumbing system already installed. In order to accommodate tenants who may wish special office arrangements or different provisions from the typical lay-out, and in order to meet their requirements as to lavatory service, it is necessary to provide wastes and supplies in such a manner as to be suitable for any demand. These may be placed near a column, or built in with the floor and left flush with the same, or with the finished plaster surface of the wall. If the fixtures are not connected at once, the wastes and supplies may be capped and be ready for future connections. The only feasible way in which a system of this kind may be made elastic is by the use of non-siphoning traps. It is not impossible, however, to provide a vent system which could be capped in the same manner as the wastes, but this would mean complications and additional difficulty in concealing the pipes, all of which may be eliminated by the use of non-siphoning traps.

Non-siphoning traps may be divided, in a general way, into three classes: one in which the waterway is so large as to preclude the possibility of siphonage; another in which the interior construction of the trap is such as to give a special motion to the water flowing into and through the trap, which many claim will prevent siphonage; the third by constructing the interior of the trap in such a manner as to form sufficient resistance so as to prevent the water being drawn out. Of the first type there are many examples among that class of traps called "pot traps" in which a portion of the water seal can be siphoned out and still leave sufficient water to prevent escape of sewer gas through the trap.

The second type is represented by traps, such as the centrifugal trap, in which the water enters the trap at an angle, or by an inlet of a special form, which gives the inflowing water a circular motion so as to make the trap, in addition to being non-siphoning, a self-cleaning trap.

The third type is represented by certain patented traps, in which the interior construction is such as to offer special resistance to the flow of the water by means of projections from the periphery towards the center, in the nature of cup plates or baffle plates.

A non-siphoning trap should not be used until thorough tests have been made under pressures which would exceed the normal pressures of a system, and under conditions which duplicate as nearly as possible the exact features of the installation in connection with which they are to be used. Non-siphoning traps should be used only in connection with outlets from lavatories or similar fixtures. A too general use of this type of trap should not be permitted, as it lets down the bars which guard the health. Satisfactory installations of non-siphoning traps would be more difficult to obtain if their use were allowed without reservation.

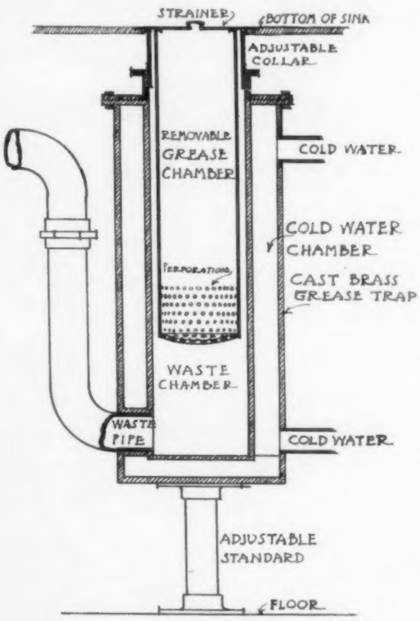


Fig. 1
Section Showing Arrangement of Grease Trap Installed with Sink

No one questions that from a standpoint of sanitation non-siphoning traps properly used are quite as perfect as any trap in a full vented system. The special conditions which must be considered in the construction of such a trap, the importance of restricting their use to installations that can be readily supervised, and the growing demand for this type of trap make it all the more necessary that strict adherence to the sanitary laws be required, and that the installations be made only by competent mechanics.

The problem of intercepting the grease from kitchen and pantry sinks before it enters the drain is often overlooked in laying out plumbing work in residences. Every residence should have a trap either located outside the house or near the kitchen sink for this purpose.

The outside grease trap should be built of brick and cement 12 feet deep and 4 feet wide, with an iron ladder on each side to afford facility for cleaning and also an iron cover flush with the ground. All the waste water from all sinks in kitchens and pantries should pass into this trap before entering the main drain.

The main waste pipe should be 3 inches in diameter with 2-inch branches to sinks.

All changes in direction in the grease trap system should be made with a Y branch and 1/8 bend with a brass cleanout in the end of the Y branch.

The outlet of grease trap should be 4-inch Ex. Hy. C. I. pipe and should turn down into the grease trap not less than 5 feet, with a brass cleanout at heel of the bend where it goes out of the grease trap, and should run 5 feet outside of main house trap.

In some residences an outside grease trap is not practical. In such cases a special grease trap should be

installed flush with the inside of the bottom of the sink, constructed with an inner cage which may be readily taken out and emptied. (Fig. 1.)

The most important part of such a trap is its installation. All the cold water used in the house should first pass through the cold water chamber of the grease trap. To accomplish this, the cold water main from the foundation wall should first be connected with the grease trap and no branches should be taken from the main until after it has left the trap.

This may cause a little additional expense, but it is the only effective way to properly install a trap of this kind, and it is so easily cleaned that the services of a plumber are seldom necessary.

As a rule, the main house trap is set inside of the foundation wall; but the proper and sanitary place to set the main house trap for residences is in an outside manhole, with an indirect fresh air supply with iron cover flush with the ground.

The water test is always made from the main house trap, and frequently a leak develops outside and allows the water to come through the foundation wall. When the drain is clogged, it is most frequently at the main house trap; if the trap is inside the wall, the removal of the cover allows the soil in the pipe to go over the cellar floor, creating a very unsanitary condition.

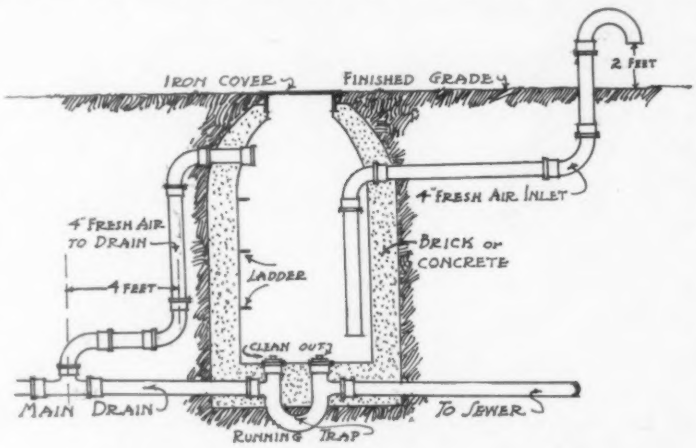


Fig. 2
Section Showing Arrangement of Main House Trap Outside of Foundation Wall

Fig. 2 shows a method of installing this type of trap outside the wall. Under these conditions the trap is protected from freezing, and a fresh air circulation through the entire sanitary system is assured.

Plumbing Fixtures. Aside from the ordinary iron fixtures which are used only in inexpensive work or in places where they will be required to withstand rough usage, such as sinks in boiler rooms, etc., plumbing fixtures are usually either enameled iron, porcelain, or vitreous china.

The enameled iron fixtures are those made of iron on the surfaces of which an enamel preparation has been baked.

Porcelain fixtures are of earthenware, which are covered both inside and out with the porcelain enamel and then "fired" in the kiln at a high temperature. Vitreous china fixtures are made from a fine grade of china clay which vitrifies when baked and produces a hard, non-crazing surface.

A fixture to be perfectly sanitary must be of a non-absorbent substance; it must not be subject to discoloration through acids or alkalies and must not easily break, crack, or craze. The surfaces should be smooth so as to be readily washed off and kept clean by each flow of water.

The applicability of various types of fixtures to the location in which they are intended to be placed must be left to a great extent to the owner or user. The majority of manufacturers at the present time produce fixtures of a high standard and of relatively equal merit. There are, however, one or two makers of fixtures in a class by themselves whose output is of an exceptionally rare quality. The catalogues give such excellent reproductions of the fixtures that a list may be formed and fixtures chosen without much trouble.

In the final selection of fixtures it is advisable, in every case where possible, to see the fixtures "under water," that is, with the water turned on the various parts of the fixture so that the action of the faucets, wastes, traps, tanks, etc., may easily be examined.

Fixtures are of three classes: "A," "B," and "C." "Class A" refers to a specially selected product of the kiln and these fixtures are supposed to be perfect. "Class B," as may be readily understood, are "seconds" and subject to slight imperfections; while "Class C" refers to the ordinary kiln run and are adapted only to the least expensive installations. Architects in specifying "Class A" should insist that imperfections in surface, color, etc., will be sufficient cause for rejection, and no reputable supply house will hesitate to replace on demand any goods which do not come up to the standard of their class.

Frequently plumbers buy the pottery from the manufacturer or jobber specified, but supply their own brass work, as the trimmings are called. This should not be permitted. An architect should specify the make of faucets, valves, etc., as carefully as the fixtures themselves and frequently assumes that he does. In order to be sure that the manufacturer's responsibility covers all parts of the fixtures, the specifications should mention that "the fixtures are to be complete in accordance with plate number blank" or "complete as per sample approved."

The fixtures should be set either entirely open, that is, without any wood work or other enclosure which would form a receptacle for dirt or be subject to decay, or they should be entirely enclosed by means of a non-absorbent substance, such as tile or hard finished cement.

Closets are known as "wash down," "siphon action," or "siphon jet," according to their construction. The "wash down" type has a large waterway through the trap, but only a small water surface in the body of the closet. The water from the flush tank enters through the rim and space at back of the closet and flushes the pan. This type is objectionable because of the noise due to the large volume of water necessary to complete the flush and the difficulty of making the fixture self-cleansing.

Siphon action closets are more frequently used to-day than any other type of closet. They are so constructed that the flush from the tank forces the water, forming the seal of the trap over the bend and fills the soil pipe. The

effect of this action is to pull the contents of the closet through the trap and into the main soil. Enough water flows from the tank to keep the seal intact. If well designed, they are self-cleansing, sanitary, have good water body and waterway, although somewhat noisy in action.

The highest type of closet is the siphon jet. This closet is the acme of perfection in that it is sanitary, self-cleansing, noiseless, and durable. More care must be taken in the manufacture of a closet of this kind on account of the difference in design, and as a result the fixtures are of a better quality. These closets in addition to being siphonic in action have a jet at the bottom of the bend which increases the effect of the flush and aids materially in the cleansing process. The water comes into the closet through the flushing rim and through the jet and forces the contents of the closet through the trap, and by the siphonic action of the mass of water draws out all the impure matter in the bowl. The jet also cleanses portions of the fixture which might become soiled.

The types of urinals in general use are the flat back lipped urinal and the porcelain enameled stall. Thanks to the advance in sanitation, the old trough types are passing away and the old non-vented open urinals are becoming things of the past. The flat backed urinal is made in two types,—one in which the trap is beyond the fixture, and the other in which the bottom of the fixture contains a water body somewhat like that in a water closet.

The porcelain stalls are more sanitary than the wall type of urinal. They are readily flushed in all parts, the surface is impervious, and there should be no crevices which may afford lodgment for germs. In using urinals of this type it is well to note that the bottom of the urinal extends below the floor, and provisions should be made for the trap, etc., at this point. A space 4 inches deep, and of the same area as the urinal will occupy, should be left in the floor construction and the "roughing-in" laid out accordingly. Another method of installing these fixtures is to raise the body of the urinal above the floor, in which case it is necessary to form a step in front of the base. This is objectionable because of the greater difficulty in maintaining a sanitary condition at the floor than when all the material is flush, and also presents the possibility of injury in case of a misstep.

In addition to the fixtures mentioned above, the ordinary sinks and slop sinks should be carefully considered in laying out plumbing work. These, however, are not of sufficient importance to require detailed explanation. In every case where possible, however, slop sinks should be of porcelain or vitreous china rather than enameled iron, in order to preclude the possibility of damage to the surface.

In connection with the installation of closets, an important feature is the floor connection. This should be an approved type of joint, consisting of a heavy brass floor plate properly secured to the branch soil pipe and bolted to the trap flange and the joint made gas tight. No rubber washers should be allowed in making up this connection, and all floor flanges should be set in place and tested before any closets are finally connected.

The wastes for lavatories are arranged in three general classes,—the so-called "pop-up waste"; the combination waste and overflow, and the ordinary "plug and chain." In the "pop-up waste" a movement of the handle controlling the waste raises a metal disk from its seat in the outlet and allows the water to flow through. The combination overflow and waste is in the form of a hollow pipe and is controlled by a handle similar to the "pop-up waste," but has no disk at the outlet, the end of the pipe being ground to fit a seat in the valve. Of these types the "standing" or combination is the most satisfactory in operation and maintenance. The "plug and chain" is objectionable because the plug is subject to damage from abrasion or cutting and the metal work of the chain is difficult to keep properly clean and sanitary.

Faucets are divided broadly into two general types,—self-closing and compression. The compression type is one in which the water is shut off by forcing a washer down to the seat of the valve and closing the port through which the water passes. The self-closing type, as the name implies, shuts off the water automatically when the pressure used to turn the water on has been released. The advantage of the compression type lies in the fact that the water may be turned on and left running without attention as long as desired, but where meters are installed and the water is paid for by the amount which passes through the meter, the compression faucets are a source of waste. The self-closing faucets on the other hand are used almost exclusively with the idea of their greater economy in water consumption, and also that they in a measure insure against damage due to water left on without attention, and a possible overflowing of fixtures.

In connection with the subject of faucets, the tanks and valves used in connection with intermittent flush, or an ordinary flush for closets or similar fixtures, might well be considered. An intermittent flush is obtained through a form of tank in which the amount of water running into the tank is regulated so as to open the valve at predetermined intervals and flush the fixtures. This form of flush is particularly valuable in public toilet rooms, and these types of valves have been so perfected that they seldom get out of order.

The regular flush valves which are used in connection with flush tanks operate either by a chain or button or handle. The float or ball cock is installed in connection with these tanks in such a manner that as the water leaves the tank the ball cock opens the supply valve. The inrushing water raises the ball cock to a point at which the water is automatically shut off, when the tank is filled. This form of tank in its ordinary construction is a source of great annoyance. It is difficult to eliminate the noise from the flush and from the inrushing water; the valves and ball cocks frequently stick and allow a continuous flow of water through the tank and fixture and require considerable attention.

The elimination of the noise from these tanks and valves has been a great problem to the manufacturer of good plumbing fixtures. To a large degree the noise may be eliminated by the use of reducing pressure valves which cut down the pressure of the water entering the tank and prevent the hissing of the valve. A form of siphon from the supply pipe into the overflow has been adopted by some makers to prevent the "gurgling," as the water leaves the tank in the flushing process. A tank that is absolutely noiseless is difficult to obtain and in a practical installation it can be counted on only when the governing conditions are most favorable.

There is one method of flushing closets, and fixtures of a like character, which is comparatively noiseless, that is, by the use of flushometers. These specially constructed valves are placed on the supply line to the fixture and so arranged that a stated amount of water will pass through the valve under pressure and the valve automatically close after this amount of water has passed through. In many cities flushometers may not be installed except where tanks are arranged for their supply.

The majority of flushometers operate at a pressure as low as 3 pounds. This latter feature is particularly desirable where fixtures are installed in an upper story, and unless connected directly to the street pressure, a sufficient head of water is not possible on account of the lack of space from the fixture to the roof. In such cases a large pipe should be installed of sufficient capacity to hold enough water, if possible, to produce the required pressure.

Cold Water Supply System. The cold water supply system for the average building or residence consists merely of the supply from the street main through the wall of the house branching from this main to the various fixtures and requires no circulation. It is essential, however, in any installation of a cold water system to extend the cold water pipes for a distance of not less than 2 inches beyond each faucet in order to provide an air chamber or air cushion, against which the water pressure may be forced, and thus prevent what is known as water hammer in the piping. The length of this air cushion depends entirely on the water pressure and must be varied to suit such conditions.

A cold water supply system for a large office building, or commercial or manufacturing establishment, consists of the supply from the street through the walls, the connection of this supply direct to a water drum, or tightly closed tank, from which the various rising lines are taken to supply the fixtures in various portions of the building. This tank maintains the same pressure at all times as in the street main, and forms a storage so that if all the faucets in the building should be open at the same time, there still would be a sufficient supply of water under pressure so that the supply from any one faucet would not be appreciably diminished.

In an installation of water supply to fixtures no pipe should be allowed under any conditions less than ¾ of an inch in internal diameter except the branches to the fixtures themselves from the supply line. When small pipes are used, the possibility of the noise from the water rushing through the pipes is very much increased.

Various kinds of pipe for water systems are used, such as lead, iron, galvanized iron, lead lined iron, tin lined iron, brass tubing, and iron sized brass pipe. The lead pipe is not allowed in the best practice because of the possibility of damage to the pipe and subsequent leakage, and also because of the action of the acids and alkalies on the lead. The iron pipe is objectionable on account of being subject to corrosion. Galvanized iron pipe is better than either of these, but is not so permanent as other forms of piping. Lead lined pipe and tin lined pipe as the names imply are iron shells with a lead or tin lining in the pipe.

The best kind of lead lined pipe is that in which the lining is well united with the iron pipe itself, other forms of lead lined piping being open to the objection that a defect in the lining would permit of the passage of water between the lead and iron and the gradual closing of the bore of the pipe until the pipe itself should be rendered practically useless. The lead lined pipe requires lead lined fittings, and in the use of pipe of this character the architect should be particularly careful to see that all fittings and all pipes are properly installed. Tin lined pipes can be easily determined by a slight crackling in the pipe when the pipe is bent, and also by cutting the end of the pipe square and clean and breathing on this cut end. The breath will make the surface of the lead turn blue, while the tin will remain bright, and in this manner the thickness of the tin lining may easily be determined.

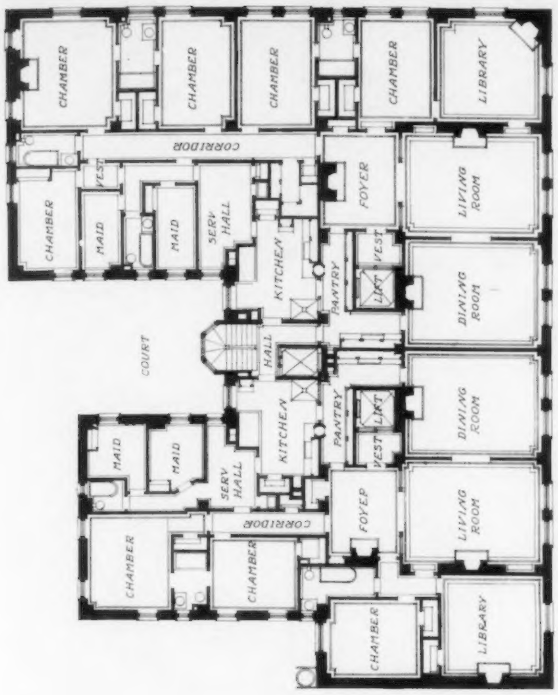
Brass tubing is a drawn tubing and should be examined to see that the thickness is the same in all parts. It should be slightly annealed or re-heated in order that it may not be too brittle for use, the harder pipes being more likely to develop defects in the nature of split pipes. Brass tubing is thinner than the iron sized pipe and is frequently called fine thread pipe. The threads for connections on this piping must be carefully cut in order not to perforate the pipe itself and make a weak joint.

Iron sized brass pipe is a brass pipe made on the same standards of dimensions, etc., as iron or galvanized iron pipe and commercially is known as I. S. pipe. This is the best of the various kinds of piping on the market and while slightly more expensive than galvanized iron pipe or tubing, repays the increased investment by its permanence and security against defects.

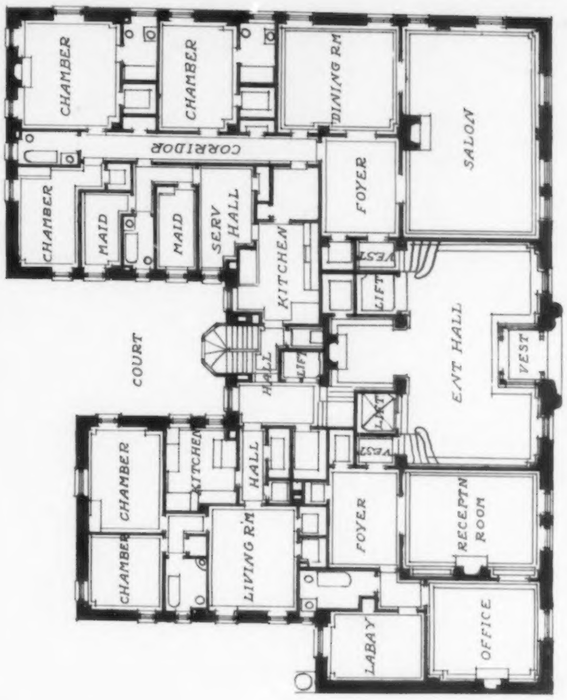
In the large cities there are two varieties of service in the street mains, — the high pressure and low pressure. High pressure is service on which the static pressure usually supplied to the various buildings is approximately 100 pounds per square inch. This service is used in connection with high buildings where a lower pressure would not force water to the highest fixtures and is used exclusively for standard sprinkler equipments, fire lines, and standpipes. The low pressure service varies from 40 to 60, 65 or 70 pounds, and is the service most generally supplied for the cold water system in buildings not over 10 stories in height.

Where high pressure service is used in connection with plumbing installations of the ordinary character, additional care must be exercised in the character of the pipes, the cutting of threads, make-up of joints and fittings, and special tests should be put on to determine the efficiency of the system before any pipes are covered up. Frequently in the larger buildings the high pressure service is extended to a certain point in the building, and reducing pressure valves are installed in order to supply the plumbing equipment with water at a more workable pressure. With low pressure service these precautions are unnecessary. Sometimes the high pressure service is extended to a tank above the highest fixtures, which tank has a sufficient capacity to supply the building, and the fixture lines or supply lines are taken directly from this tank. In such cases the necessity of a reducing pressure valve is eliminated.

APARTMENT HOUSE, 405 PARK AVE., NEW YORK, N. Y.
CROSS & CROSS, ARCHITECTS



TYPICAL FLOOR PLAN



FIRST FLOOR PLAN

DETAIL OF CORNICE AND BALUSTRADE

APARTMENT HOUSE, 405 PARK AVE., NEW YORK, N. Y.

CROSS & CROSS, ARCHITECTS

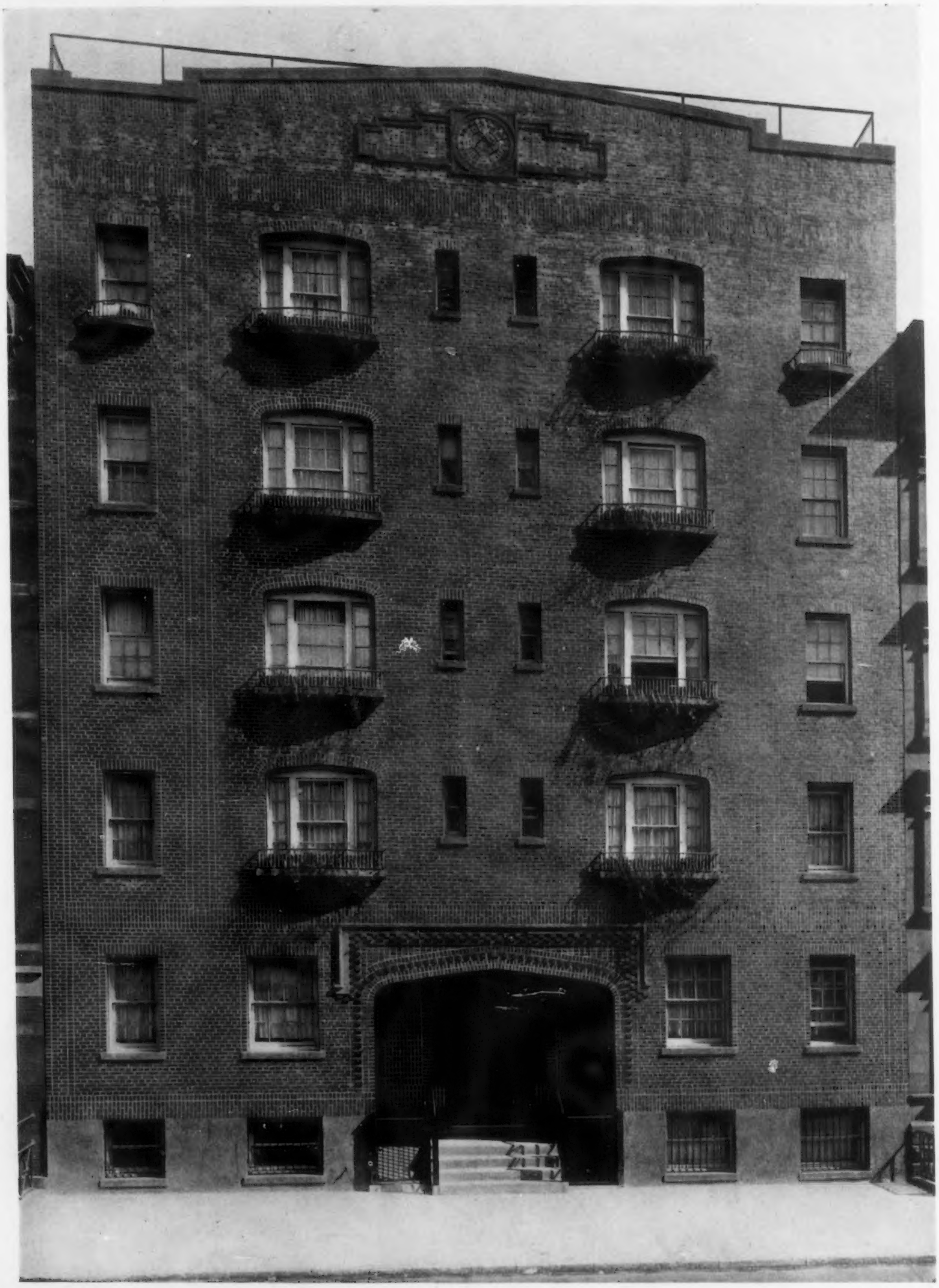
DETAIL OF WINDOW AT FOURTH STORY

DETAIL OF ENTRANCE

ENTRANCE HALL

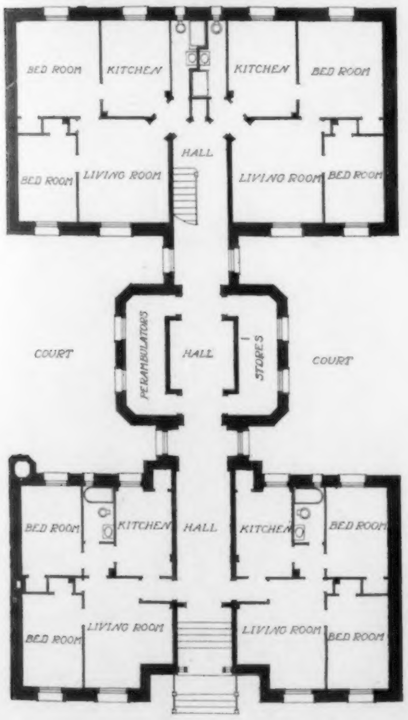
APARTMENT HOUSE, 405 PARK AVE., NEW YORK, N. Y.

CROSS & CROSS, ARCHITECTS



THE ROGERS TENEMENTS, WEST 44TH STREET, NEW YORK, N. Y.
GROSVENOR ATTERBURY, ARCHITECT

DETAIL OF ENTRANCE



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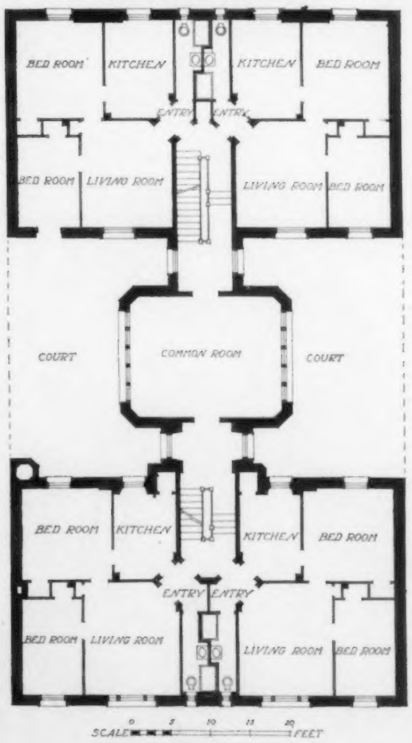
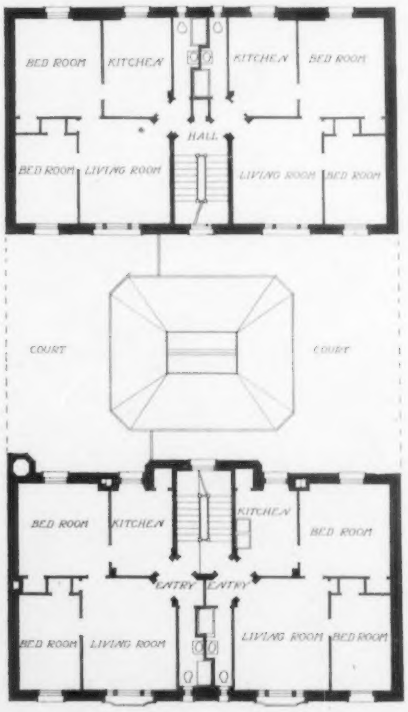


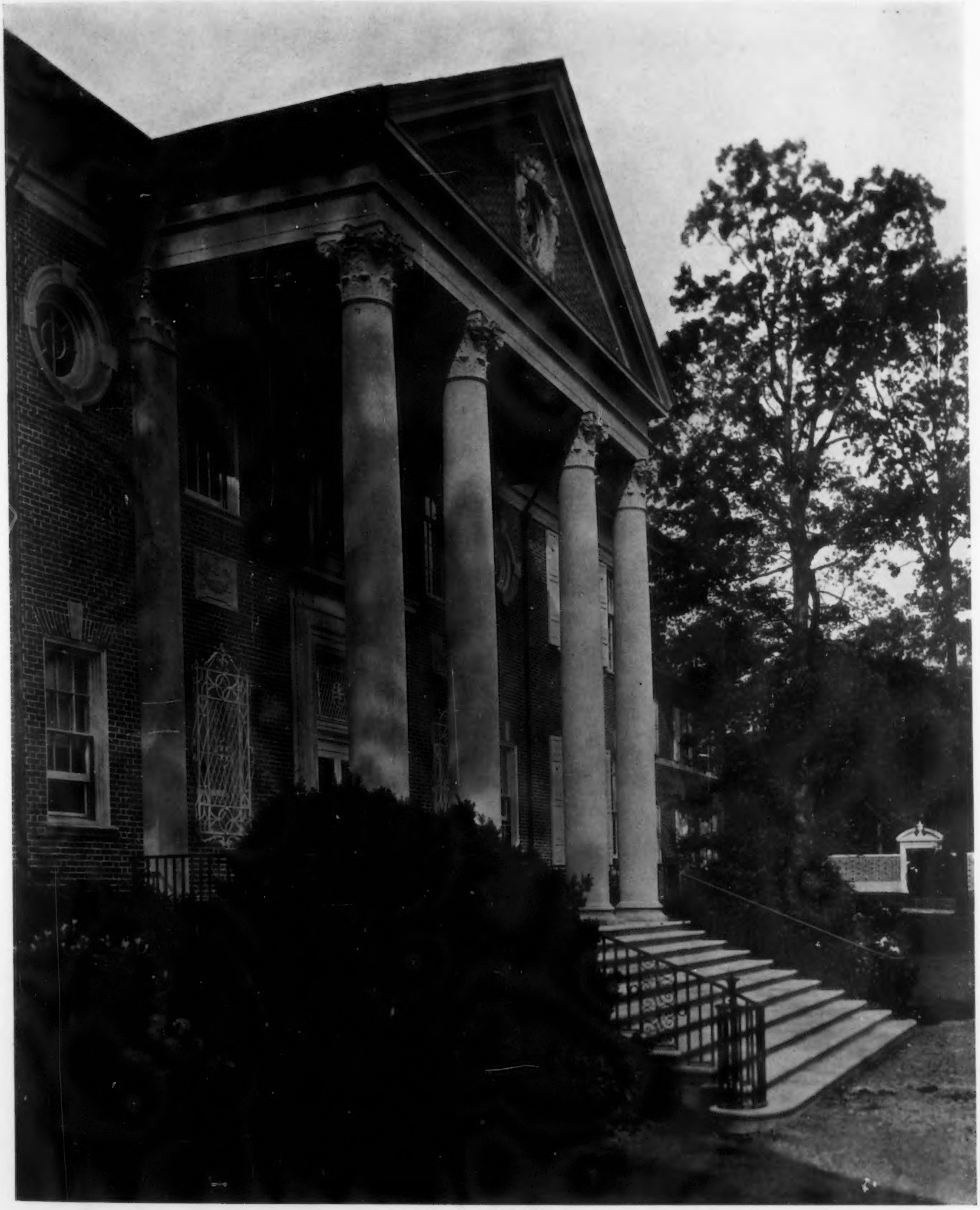
SECOND FLOOR PLAN



TYPICAL FLOOR PLAN

THE ROGERS TENEMENTS, WEST 44TH STREET, NEW YORK, N. Y.

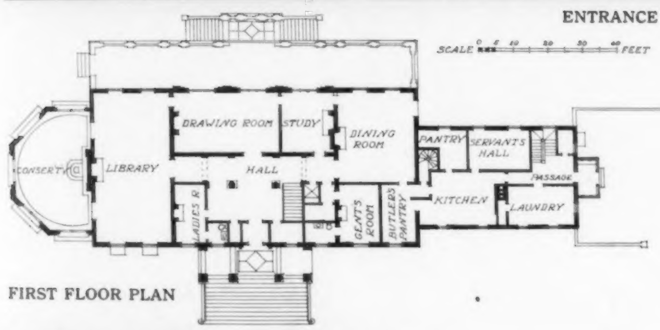
GROSVENOR ATTERBURY, ARCHITECT



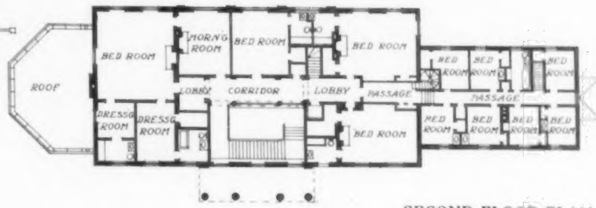
ENTRANCE PORTICO

HOUSE OF JAMES PARMELEE, ESQ., WASHINGTON, D. C.
CHARLES A. PLATT, ARCHITECT

ENTRANCE FRONT



FIRST FLOOR PLAN



SECOND FLOOR PLAN

GARDEN FRONT

HOUSE OF JAMES PARMELEE, ESQ., WASHINGTON, D. C.

CHARLES A. PLATT, ARCHITECT

DETAIL OF HALL AND STAIRCASE

DINING ROOM MANTEL

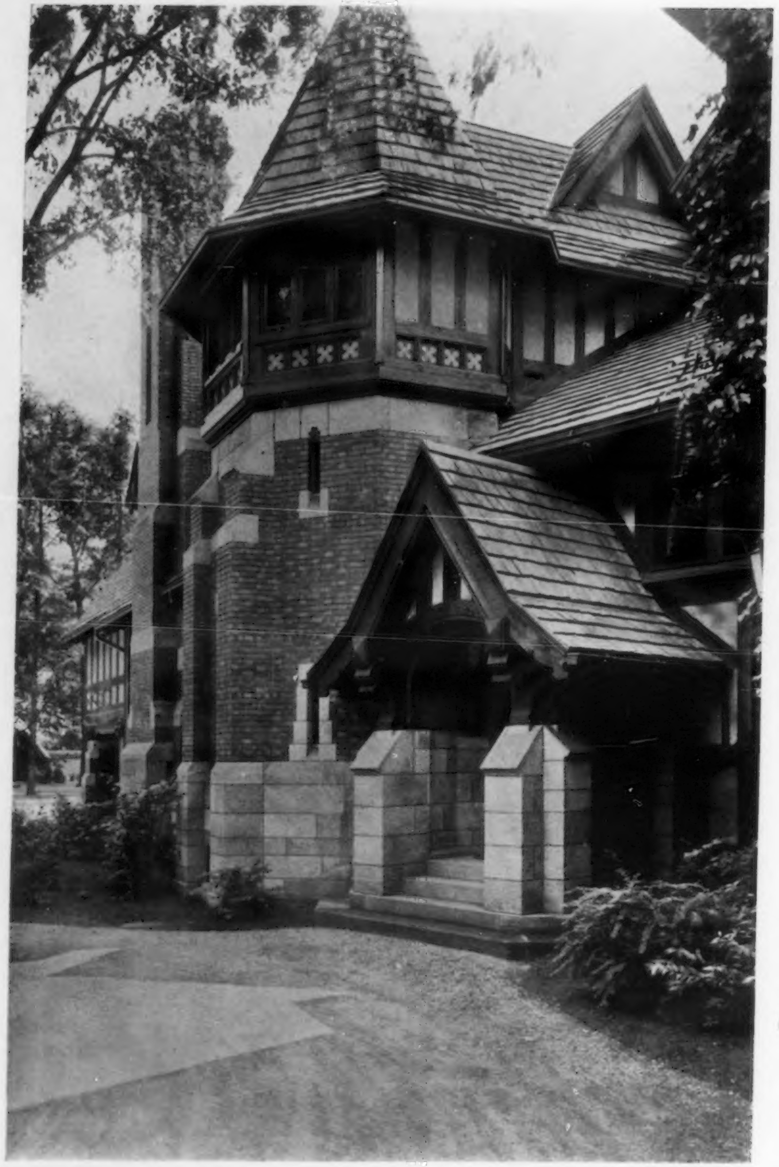
HOUSE OF JAMES PARMELEE, ESQ., WASHINGTON, D. C.

CHARLES A. PLATT, ARCHITECT

VIEW LOOKING TOWARD MUSIC ROOM BAY

ADDITIONS TO HOUSE OF ABRAM GARFIELD, ESQ., CLEVELAND, OHIO

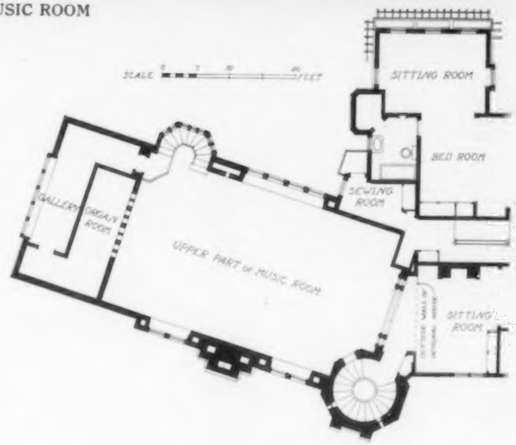
ABRAM GARFIELD, ARCHITECT



ENTRANCE PORCH

MUSIC ROOM

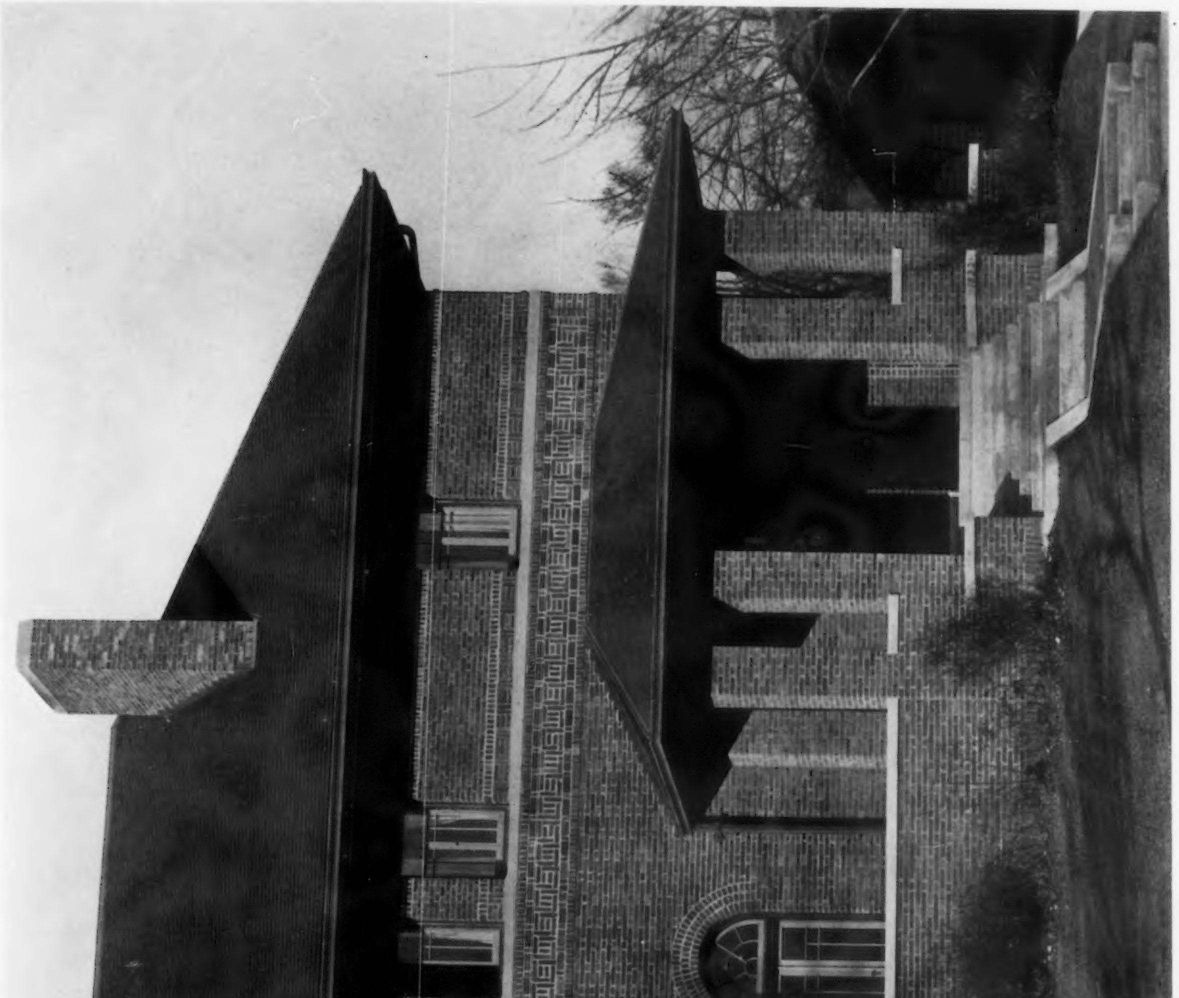
FIRST FLOOR PLAN



SECOND FLOOR PLAN

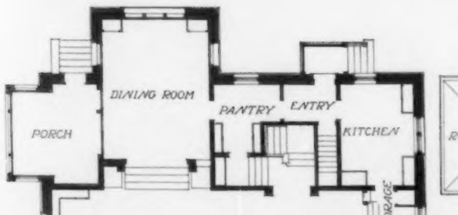
ADDITIONS TO HOUSE OF ABRAM GARFIELD, ESQ., CLEVELAND, OHIO

ABRAM GARFIELD, ARCHITECT

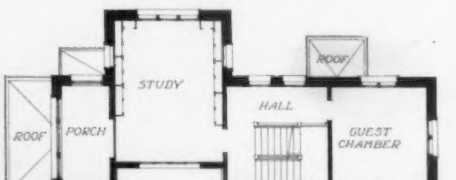


HOUSE OF MRS. A. C. D. RILEY, EVANSTON, ILL.
PERKINS, FELLOWS & HAMILTON, ARCHITECTS

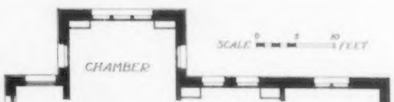
DETAIL OF FRONT ELEVATION



FIRST FLOOR PLAN



MEZZANINE FLOOR PLAN



SECOND FLOOR PLAN

HOUSE OF MRS. A. C. D. RILEY, EVANSTON, ILL.

PERKINS, FELLOWS & HAMILTON, ARCHITECTS

VIEW FROM STREET

VIEW FROM GARDEN

TWO HOUSES ON WOODLAWN AVENUE, CHICAGO, ILL.

RIDDLE & RIDDLE, ARCHITECTS

VIEW FROM NORTHEAST

TWO HOUSES
ON
WOODLAWN AVENUE,
CHICAGO, ILL.

FIRST FLOOR PLANS
AT LEFT

SECOND FLOOR PLANS
AT RIGHT

RIDDLE & RIDDLE,
ARCHITECTS

VIEW FROM NORTHEAST

SECOND FLOOR PLAN

FIRST FLOOR PLAN

VIEW FROM SOUTHEAST

HOUSE OF HIRAM WALKER, ESQ., WALKERVILLE, ONTARIO, CANADA

BURROWES & WELLES, ARCHITECTS

Design and Construction of Roof and Wall Trusses.

III. DESIGN OF CONNECTIONS IN WOOD AND STEEL TRUSSES.

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AT the intermediate top chord joints there are usually two members to be connected to the chord at each joint. In the ordinary construction one of these is composed of one or more round rods and the other of wood. Fig. 50 shows a very common detail. The connection shown for the rod is objectionable as, unless the rod is small as shown, the standard cast iron washers do not provide sufficient bearing area on the wood to transmit the full strength of the rod. The same criticism often holds good for the wooden strut. Resolving the stress into the two components M and N as shown, the area of the *rafter* along ab must be sufficient to carry the stress N, and the area along ac on the *strut* must be sufficient to carry the stress M. The cut ac is sometimes made normal to ab, and occasionally the cut in the rafter is made as shown by the dotted lines cdb. If the strut is considerably larger than is required to take its stress, any of the cuts answer very well.

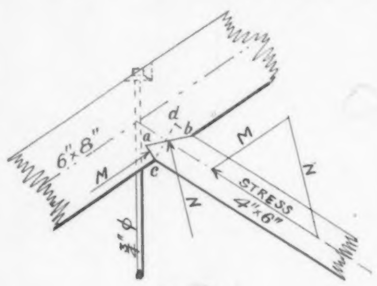


Fig. 50

The detail shown in Fig. 51 is so designed that there are no excessive stresses. The cast iron angle washer has sufficient area in bearing across the grain along ef, and with the grain along de, of the wood, to carry the corresponding components of the rod stress. The white oak angle block is more than sufficient in bearing areas to care for the strut stress. This block is preferably made of cast iron, as shown in Fig. 52. The wooden angle block shown in Fig. 51 is made with the grain running parallel to the rafter. This arrangement makes the pressure from the strut act on a diagonal surface of the wood, and the allowable pressure on this surface is given by the expression $r = q + (p - q)(\theta/90)^2$*, where q is the permissible pressure across the grain and p that with the grain. Taking $q = 500$, $p = 1{,}400$, and $\theta = 30°$, $r = 600$ pounds per square inch.

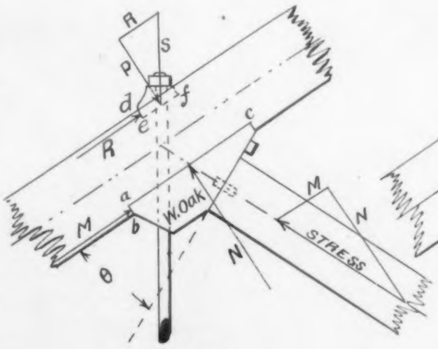


Fig. 51

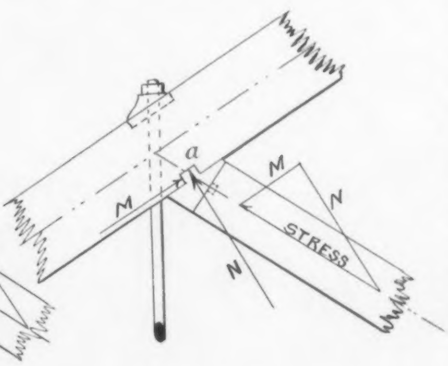


Fig. 52

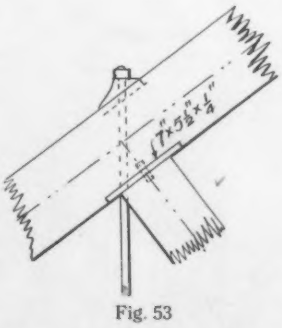


Fig. 53

* Design of Simple Roof Trusses in Wood and Steel, by Malverd A. Howe, John Wiley and Sons, Inc., New York City.

Then a stress of 9,000 pounds requires a bearing area of 15 square inches.

If the block is made with the grain normal to the page, the bearing across the grain for the same kind of wood is 500 pounds per square inch, and 18 square inches are required for a stress of 9,000 pounds. When the strut is normal or nearly normal to the rafter, the bearing is practically across the grain of the rafter. Taking a stress of 9,000 pounds and a 5½ by 5½ inch strut, it is evident that there is not sufficient bearing area if the rafter is made of short-leaf yellow pine. This is best provided for by a rectangular steel plate as shown in Fig. 53. The net area of this plate is $9{,}000/250 = 36$ square inches. If the breadth is 5½ inches, the length is about 6½ inches, say 7 inches, since a part of the bearing area is lost in providing for the passage of the vertical rod. The thickness may be roughly taken as ⅓ the overhang, which is ¾ inch in this case, and therefore the thickness of the plate is ¼ inch. This is the minimum thickness of plate which should be used under any circumstances. The use of a plate can be avoided in this case by making the strut 6 by 8 inches (5½ by 7½), which gives sufficient bearing area on the rafter.

The detail shown in Fig. 54 occurs when the Pratt system of bracing is used. The cast iron angle washer is proportioned in the manner outlined for Fig. 51. The vertical strut is connected by mortise and tenon to the rafter. The end of the tenon in the plane ef must have sufficient area to give the required bearing on the inclined cut in the rafter. If the rafter is very steep, this detail will not answer, as too much of the rafter will be cut away in making the mortise. The details shown in Figs. 55 and 56 can be used to advantage in some cases. The cast iron angle block shown in Fig. 55 can always be so designed that no excessive cutting of the rafter is necessary. The

two lugs shown on the angle washer reduce the work of cutting, but necessitate rather long castings in order that there may be sufficient wood between the lugs to resist in longitudinal shear the stress transferred to the ends of the wood fibers by one lug of the angle washer.

When the top chord of a truss is horizontal or nearly so, the vertical members of the web are usually round rods and the diagonal members rectangular timbers. Such trusses are commonly built with a counter brace in each panel. The detail of a top chord joint is shown in Fig. 57. The washer under the nut of the vertical rod is made of rolled steel or of cast iron (Fig. 58), and for very heavy trusses a rolled channel reinforced by a flat plate is employed (Fig. 59). Whatever type of washer is employed, it must have sufficient bearing area against the wood to safely transfer the rod stress. The main brace and counter brace have square bearings against an angle block. If this is made of wood, the grain should run parallel to the top chord unless the chord is very broad, and then the grain runs perpendicular to the chord. In determining the depth of the notch for the angle block, the effect of the counter brace is neglected. When the fibers of the angle block are perpendicular to the chord, the notch will be over twice as deep as when they run parallel to the chord.

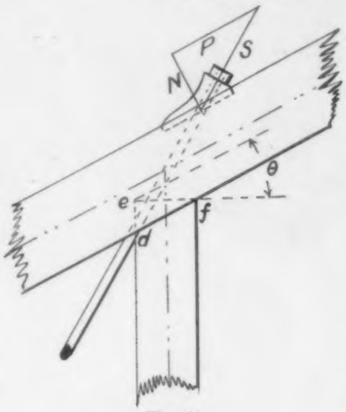


Fig. 54

Center Top Chord Joints of Wooden Trusses. This joint is best made by using a cast iron angle block as shown in Fig. 60. The wooden members have square bearings and the vertical rod transmits its stress directly to the casting without the use of a washer. The detail shown in Fig. 61 is often employed. The bent plate holds the wooden members in place. Care must be exercised to see that the distance ab is sufficient to safely transfer the rod stress to the inclined fibers of the wood. The connection shown in Fig. 62 is designed in the manner outlined for the splice shown in Fig. 47. (See preceding paper, April, 1915.) The connection consists of two side plates to which are riveted bearing bars. The plates are fastened to the chords by lag screws or bolts, the former being preferable. When the Pratt system of web bracing is used, the detail shown in Fig. 63 may be employed, provided the wooden members are of sufficient size to permit of the necessary cutting for the rods. The diagonal rods should be in pairs and arranged symmetrically about a longitudinal plane passing through the center of the top chord. A cast iron angle block is more expensive than the detail shown, but it makes a much better connection. Fig. 64 shows a connection used in the truss shown in Fig. 11a. (See first paper, March, 1915.) The chord members are made up of two pieces, 4 by 12 inches each, separated by packing blocks 4 inches thick.

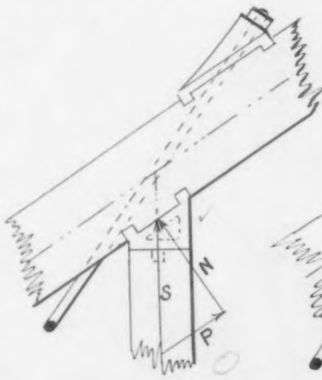


Fig. 55

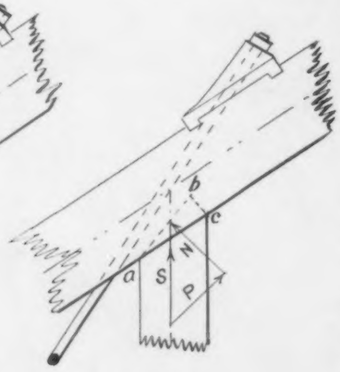


Fig. 56

Intermediate Bottom Chord Joints of Wooden Trusses. For the present it will be assumed that the bottom chord is horizontal, or nearly so. Practically the details of the connections are the same as shown for the top chord joints. Figs. 65–70 show details in use. The two first shown are suitable for light trusses. The center joint is usually made as shown in Fig. 70, when the Howe type of bracing is used. When rods are used for diagonals, the center joint has but one web member, which is a vertical. Very often the chord is spliced at this joint, and, when this is done, the splice must be designed considering the effect of the notch for the angle block when diagonals meet at this point.

Joints at the Supports of Wooden Trusses. The joint at the support of a wooden truss is not easy to design unless there is a great surplus of material in the truss members meeting at this point. The detail shown in Fig. 71 is composed entirely of wood, the bolts A and B being used solely to keep the members in place. The entire stress in the top chord member is transferred to the inclined surface ab of the bottom chord member, and the horizontal component of the stress is resisted by the longitudinal shear of a T-shaped piece as shown by the dotted lines cbb′c′. To provide sufficient bearing area on the support and to counteract the effect of bending due to the eccentric action of the forces at the joint, a white oak bolster is used which is thoroughly bolted to the bottom chord. To anchor the truss to the supports, two angles or bent plates are sufficient.

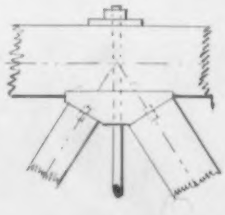


Fig. 57

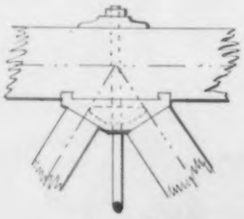


Fig. 58

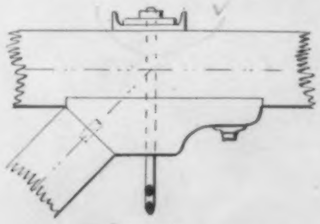


Fig. 59

The cast iron angle block shown in Fig. 72 may be used to advantage if not placed too near the end of the bottom chord. There must be enough wood in longitudinal shear on the left of the lugs on the angle block to resist the horizontal component of the stress in the rafter. The vertical component of this stress produces generally a variable stress across the wood fibers of the bottom chord member. This stress is a maximum at the left end of the block. The bolts

probably take some stress at times, but should be neglected in designing the angle block, as the bolts and lugs cannot be made to act at the same time.

The detail shown in Fig. 73 was used in the trusses of a blacksmith shop of the Boston & Maine Railroad at Concord, N. H.

The arrangement shown in Fig. 74 was used in a round house roof at Urbana, Ill. Here the total component B is taken by two bolts. The principal difficulty in designing this form of joint is in getting sufficient bearing area for the bolt stress at D. When steel plate is available, the detail shown in Fig. 75 may be used. The four or more vertical bolts and the hook at A carry the horizontal component of the rafter stress to the bottom chord.

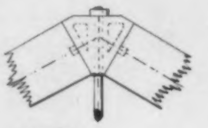


Fig. 60

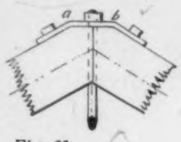


Fig. 61

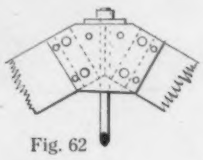


Fig. 62

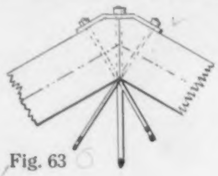


Fig. 63

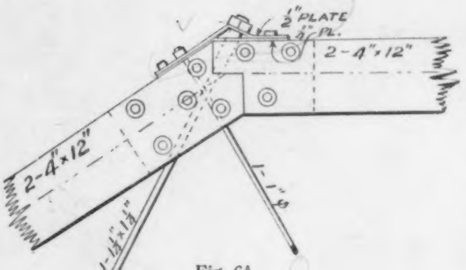


Fig. 64

Hook bolts are used at A to prevent the bent plate from drawing out of the notch in the timber.

The *effective depth* of the notch is about twice the thickness of the plate used. The inclined bolts have an unknown stress. Their function is to prevent the plate from bending at B, when possible, the depth CB should be sufficient to ensure that the stress on the inclined cut on the rafter is not excessive. This stress is, of course, modified by the inclined bolts. The bolster is bolted and keyed to the bottom chord member as shown.

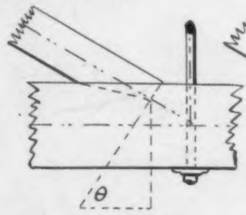


Fig. 65

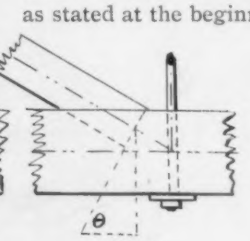


Fig. 66

The detail shown in Fig. 76 is preferable to that shown in Fig. 75, but is more expensive.

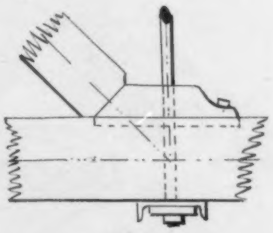


Fig. 67

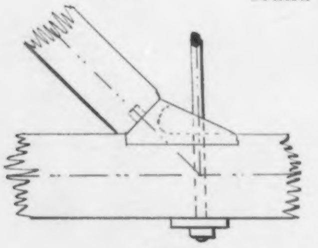


Fig. 68

The connection shown in Fig. 77 is composed of two side plates and sufficient bearing bars to take the stresses in the top and bottom chord members. The bars are riveted to the side plates and these are fastened to the wooden members by lag screws. The lag screws in the compression member must be spaced on centers not over thirty times the thickness of the side plate in order that the plate may not buckle.

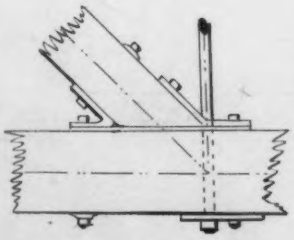


Fig. 69

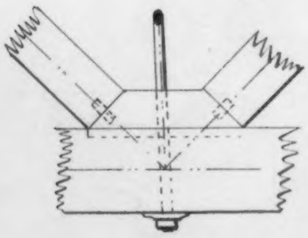


Fig. 70

The detail which is shown in Fig. 78 is very compact and can be easily adjusted. Fig. 79 shows a similar detail which was used in an auditorium in the city of Seattle, Washington.

DESIGN OF CONNECTIONS FOR STEEL TRUSS MEMBERS.

The members of steel roof trusses are generally composed of two rolled angles which are placed back to back and separated by the thickness of the gusset plates which connect the several members meeting at a joint. For spans exceeding 80 feet, the top chord is often made of two angles and a plate as shown in Fig. 80b. For very heavy trusses the top chord is made of two channels as shown in Fig. 80c. Sometimes the channels are latticed top and bottom and sometimes a cover plate is used on top and lattice bars on the bottom. The H section shown in Fig. 80d is also used for heavy truss members. Channels and I beams are sometimes used for the web members. The greater percentage of roof trusses have their members composed of two angles as stated at the beginning of the paragraph.

In selecting angles only those marked *standard* should be considered, as the selection of other angles may cause delay and expense.

Considering the stresses alone, it is usually the case that numerous members of roof trusses are found which require but one angle, and a very light one at that, to resist the stress. To avoid as much as possible eccentric stresses, two angles should always be used. The thickness of the metal should not be less than ¼ inch and the angle legs through which rivets pass should not be less than 2¼ inches. This provides sufficient metal to allow for some deterioration through rusting, and also permits the use of ¾-inch rivets throughout the structure.

Regardless of the smallness of the stress to be transmitted, the angles carrying the stress should have at least *two* rivets connecting them to the gusset plate, and in the best designing three rivets are used.

The extra metal and rivets provided by the above requirements add greatly to the rigidity of a truss, without any serious addition to the cost.

In selecting the particular form of truss to be used, the question of transportation should be considered. Trusses, or parts of trusses, which have one dimension not exceed-

ing 10 feet, can be transported by rail. By keeping this in mind, the number of field connections to be made can often be greatly reduced. Of course, if the trusses must be transported any distance on wagons, the size of the fractional parts will be governed by this portion of the transportation. As a general rule, field connections should be reduced to a minimum. It is seldom that the weight of an ordinary roof truss is so great that it cannot be raised as a whole and put in the place it is to occupy; therefore the field connections should be made before the truss is put in place. In some instances local conditions will prevent this, and the various parts will have to be raised separately and then assembled.

Compression Members in Steel Trusses are designed with the aid of empirical formulæ which contain a governing factor called the slenderness ratio. This ratio equals the unsupported length of the member divided by the least radius of gyration of the cross-section of the member. The least radius of gyration is usually designated by the letter r. Tables are easily obtained which give the values of r for the sections shown in Fig. 80. The approximate values shown in the figure can be used for preliminary calculations.

All compression members are made full length where it is possible. Even the rafter of a truss for a pitched roof is made continuous and of the section necessary to carry the maximum stress. This statement is, of course, dependent upon the transportation facilities. Making the rafter full length increases the amount of steel in the rafters, but reduces the size of gusset plates and the number of rivets, and, moreover, adds to the stiffness of the truss.

The two angles composing a compression member must be fastened together at intervals, so that the slenderness ratio for a single angle does not exceed that of the two angles used. A stay rivet every two or three feet of the unsupported length of the member is generally sufficient to fulfil the above condition.

Each pair of angles forming a compression member of a truss should have the line passing through the centers of gravity of its cross-sections coincident with the line of stress, to avoid as much as possible eccentric distribution of stress. Since it is impossible to rivet angles to the gusset plates without having eccentric stresses, it is common practice to assume the rivet lines as coincident with the line of stress.

Unless the truss is very heavy, each angle is attached to the gusset plates by rivets passing through but one leg, which apparently introduces large bending stresses. Tests in tension show that over 80 per cent of the net strength of the angles is developed when but one leg is connected, and that this percentage is not greatly increased by the use of hitch angles in attempting to connect the other or outstanding legs to the gussets. Using the low unit stresses commonly specified for roof truss work, it is quite permissible to connect one or both legs of the angles as is most convenient.

Design of Tension Members in Steel Roof Trusses. The design of tension members for steel trusses requires but little

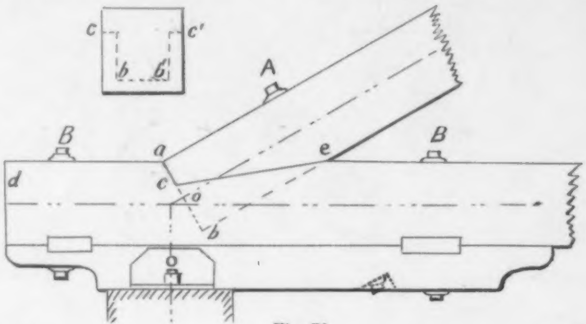


Fig. 71

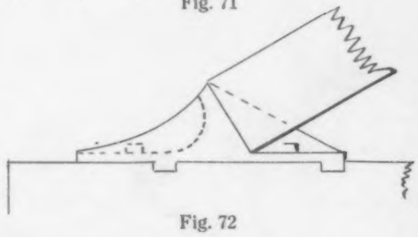


Fig. 72

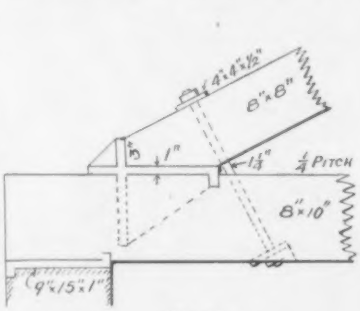


Fig. 73

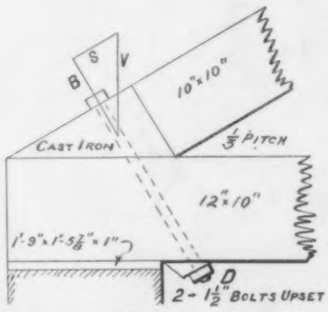


Fig. 74

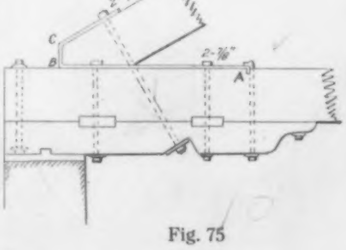


Fig. 75

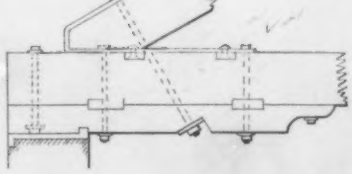


Fig. 76

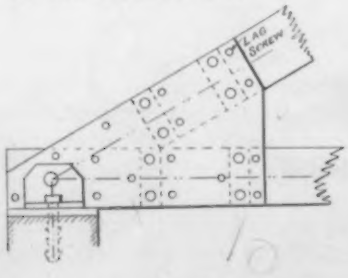


Fig. 77

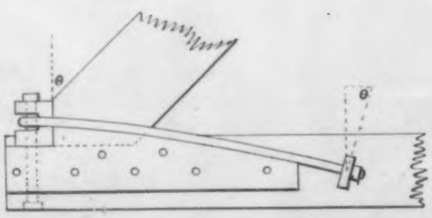


Fig. 78

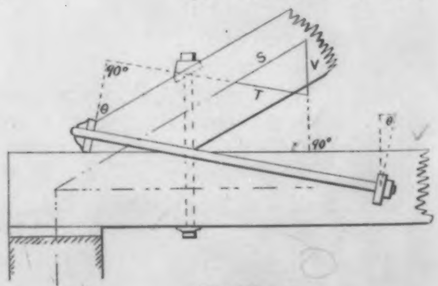


Fig. 79

explanation. The area available of any pair of angles for resisting tension is the difference between the gross area of the angles and the area destroyed by rivet holes. When each angle is connected to the gusset plate by rivets through one leg, it is customary to deduct the area destroyed by one rivet hole from the area of each angle (the diameter of the hole being taken ⅛ inch larger than the nominal size of the rivet). When hitch angles are used (see Fig. 91), practice is not uniform; some deduct two holes and some but one. In case the rivets attaching the hitch angles to the angles are in the same cross-section as those in the other legs, allowance must be for two holes. If the rivets are staggered, but one hole for each angle may be deducted.

Design of Joints in Steel Trusses. At the apexes of the truss the various members are connected through gusset plates. These plates are never less than ¼ inch thick and seldom thicker than 7/16 inch. For all ordinary trusses the gusset plates may be made ⅜ inch thick.

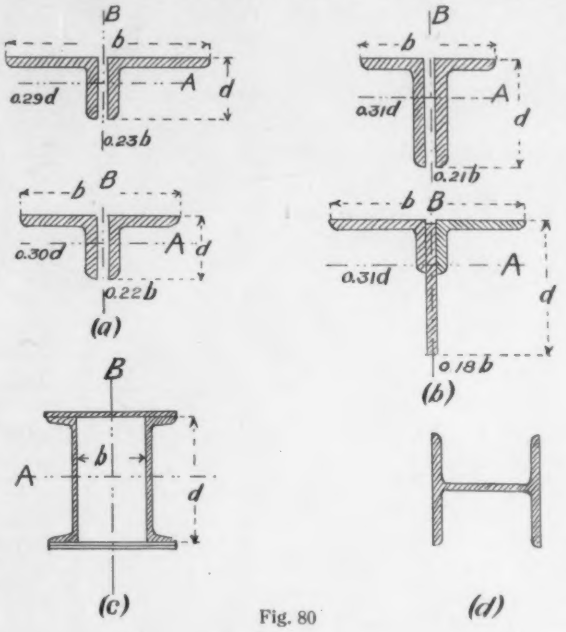


Fig. 80

Except for very light trusses, the rivets are either ¾ inch or ⅞ inch in diameter. Since the minimum thickness of the angles is ¼ inch and that of the gusset plates not over ½ inch, the capacity of the rivets is governed by their bearing on the gusset plates, this value being less than the capacity of the rivets in double shear. The number of rivets required to connect any member to a gusset plate is found by simply dividing the stress in the member by the capacity of one rivet. As previously stated, not less than two rivets should be used in making any connection.

Top Chord Joints in Steel Roof Trusses. Two joints are shown in Figs. 81 and 82. The top chord is not broken at the joints, and consequently no rivets are required to connect it to the gusset plates considering the stresses in the chord members only. However,

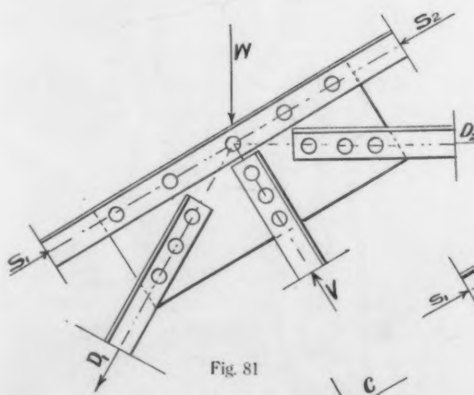


Fig. 81

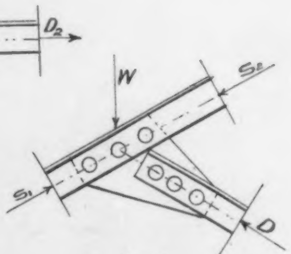


Fig. 82

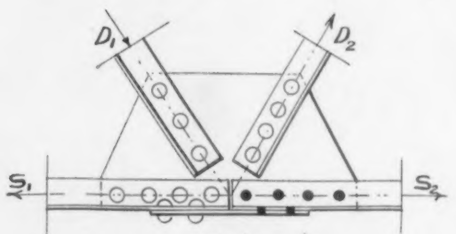


Fig. 83

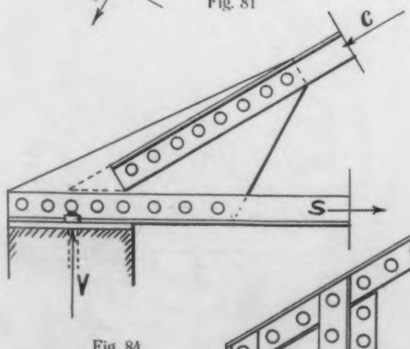


Fig. 84

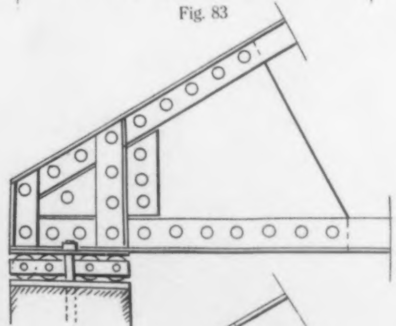


Fig. 85

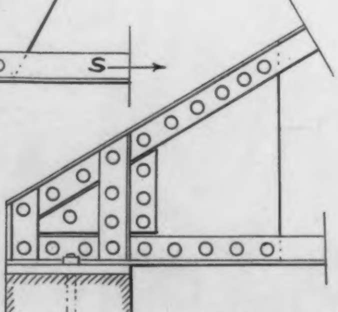


Fig. 86

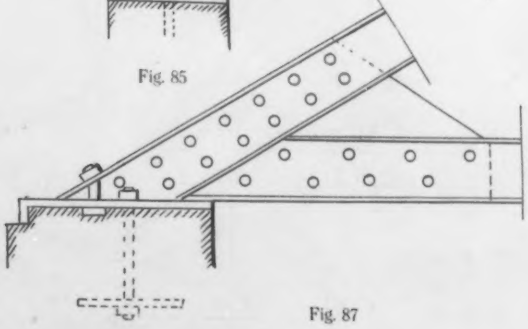


Fig. 87

there is an unbalanced stress in each case due to the other members at the joints which requires attention. Considering the joint shown in Fig. 82, and assuming that the stresses in the members occur at the same time, the number of rivets required in the chord member will be the same as in the diagonal web member, since the stress in this member is the resultant of the purlin load, W, and the two chord stresses, all of which act upon an unbroken piece. For the connection shown in Fig. 81 the number of rivets through the chord member must be sufficient to transmit the resultant of the purlin load, W, and the two chord stresses, S_1 and S_2. In case the maximum stresses in all of the members at a joint do not occur at the same time, then W, S_1, and S_2 must be considered for the different cases, and the maximum number of rivets found in any case will be the number required.

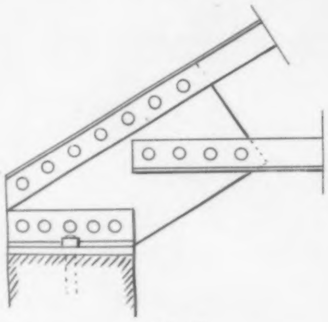


Fig. 88

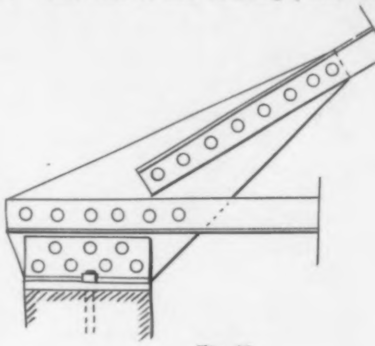


Fig. 89

If the top chord is not continuous as shown, but is cut at the center of the gusset plate, then the number of rivets required for transmitting the stresses, S_1 and S_2, to the gusset plate is found in the usual manner. The purlin load, W, will be transmitted through one of the chord members. If the purlin rests upon the chord member upon the left, then the number of rivets in this member will be governed by the resultant of W and S_1. Practically the number of rivets required for S_1 and S_2 can be found in the usual manner and then enough added to carry the purlin load W. This provides an excess of rivets.

Bottom Chord Intermediate Joints for Steel Roof Trusses. These do not differ essentially from those just considered. Fig. 83 shows a joint where the chord is not continuous, and also the proper method of connecting the two members. The use of the gusset plate to splice chord members is not permitted by some specifications. An independent splice relieves the gusset plate of severe stresses and also permits the use of a smaller plate and fewer rivets. All things considered, the independent splice is preferable. The method shown in Fig. 83 is common practice, however.

Joints at the Supports of Steel Roof Trusses. The form of this joint is governed by many conditions. Fig. 84 shows a common type for trusses of short span which are supported on masonry walls. If the top chord angles are cut square at the ends as shown in the figure, the gusset plate under a compressive stress is unsupported laterally for a considerable distance, and, therefore, it is better practice to make the cut as shown by the dotted lines. The size of the bearing plate must be sufficient to safely transmit the vertical reaction to the masonry, and also provide room for two anchor bolts outside of the bottom chord angles. The number of rivets in the bottom chord angle is governed by the resultant of V and S.

At the fixed end of the truss but one plate on the masonry is required, but at the other end two plates are needed. The upper plate is given freedom to slide by elongating the holes for the anchor bolts to provide for small longitudinal movements of the truss.

For trusses having spans exceeding 70 feet, some form of roller bearing is provided at one end. Fig. 85 shows one type of roller bearing and Fig. 86 a detail of the fixed end of a very heavy truss of long span.

The detail shown in Fig. 87 is expensive if proper bearing is provided for between the truss members and the cast iron wall plate. The details shown in Figs. 88 and 89 are good practice. They provide a definite bearing on the wall which is independent of the truss members.

When it is necessary to support trusses on steel columns, the connections are best made by means of gusset plates as shown in Figs. 90 and 91. If it is not possible to use gusset plates, then connection angles are employed as shown in Fig. 92. In these forms of connections no special provision is made for expansion or contraction due to changes of temperature.

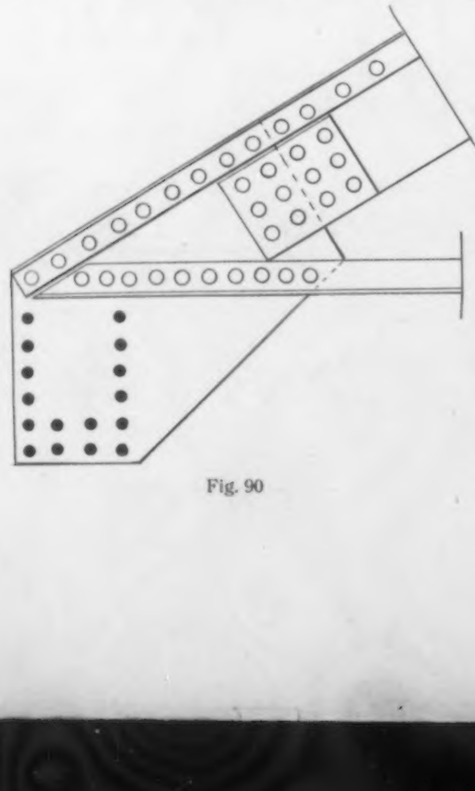


Fig. 90

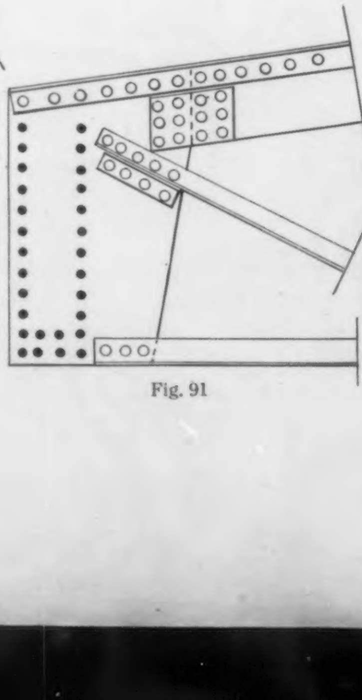


Fig. 91

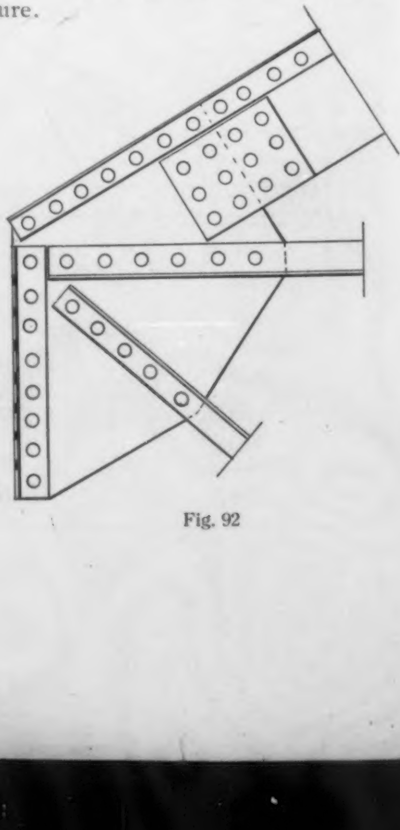


Fig. 92

The Musicians' Mutual Relief Society Building, Boston.

MAHER & WINCHESTER, ARCHITECTS.

THIS building was designed to accommodate the Musicians' Mutual Relief Society and the Boston Musicians' Protective Association. It is unique in its character and one of the first of its type to be erected in this country. Its main purpose is to provide a club house or meeting place for the musical societies mentioned above and to provide offices where the business affairs of the organizations can be carried on. The large ballroom with the necessary accessories is used for conventions and large meetings and also provides a source of income, for the building has been so arranged that the ballroom as well as the banquet room in the basement can be rented without encroaching upon the privileges of the members of the musical societies who use the building as a club.

The building has a frontage of 100 feet on St. Botolph street and 80 feet on Garrison street, and is of fireproof construction. The exterior is of dark red brick and limestone, the brickwork being laid with a wide joint in various bonds and the cornices ornamented with carved lyres and the names of famous musicians.

The first floor is occupied by a large assembly room, with entrances from both streets, for carrying on the general business of the associate members. It has a terrazzo floor and alcoves for reading, games and billiards, and telephone booths, also offices for each society, a ladies' room; and a directors' room. The remainder of this floor is given to the ballroom lobby.

In the basement is a kitchen and restaurant, toilets, showers, barber shop, and a large locker room with metal lockers of sizes to accommodate the various instruments of the members. The remainder of the basement is occupied by the boiler room, a large storeroom, and a banquet room with serving room and toilets adjacent which can be let separately or in conjunction with the ballroom.

The ballroom lobby on the first floor has entrances from St. Botolph street and the passageway at the rear of the building. Two staircases ascend from this lobby to a mezzanine floor containing the checking rooms, etc., and from thence to the ballroom floor. This room is especially fitted to serve the purposes of either an auditorium or a ballroom. It has a large stage at one end and seats on a raised platform running around the other three sides. A gallery seating two hundred people is on the Garrison street side. The floor of the ballroom when used as an auditorium is covered with a canvas, and by the use of portable chairs an audience of eleven hundred is accommodated.

The use of the space at the left side of the ballroom in which the staircases are located has been ingeniously made to serve several purposes by a full use of mezzanine

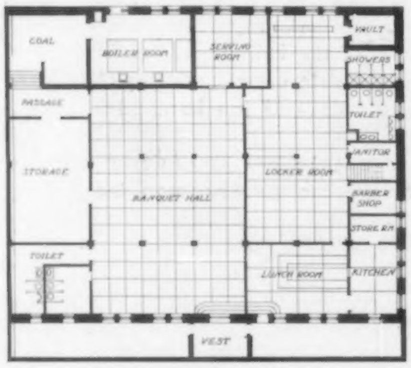
Building for the Musicians' Mutual Relief Society, Boston, Mass.
Maher & Winchester, Architects

Stage in Ballroom

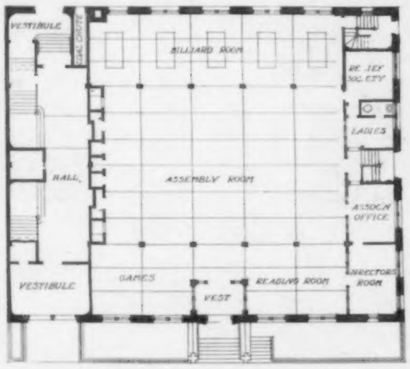
floors, the level below the ballroom floor providing ample and conveniently located checking rooms, and that above the ballroom floor, on either side of the stage, retiring rooms for men and women. The disposition of these floors is not shown on the plans reproduced herewith, but their position is shown in the general view of the exterior, as well as the way in which the ballroom entrance has been made a separate feature in the composition of the main façade to make a distinction between the uses of the building.

The proscenium arch is decorated in modeled stucco with trophies of the various musical instruments. The soffits of the ceiling beams are similarly decorated with little figures playing instruments and illustrating the various dances.

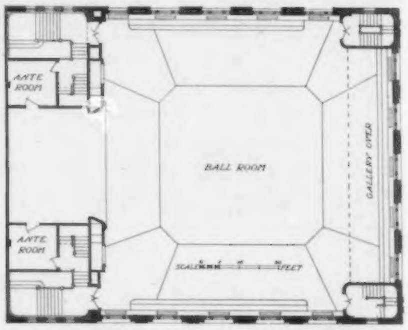
The cost of the building was 25 cents per cubic foot. This includes construction, heating, plumbing, wiring, vacuum-cleaning system, ballroom draperies, cushions, portable and gallery chairs, canvas-floor covering, window shades and screens, metal lockers and checkroom cubicals, lighting, kitchen and serving-room fixtures, blackboards, and telephone booths.



Basement Floor Plan



First Floor Plan



Second Floor Plan

Detail of Main Entrance

Detail of Upper Stories

√

As He Is Known, Being Brief Sketches of Contemporary Members of the Architectural Profession.

J ALBERT KAHN

ALBERT KAHN was born in Rhaunen, Germany, in 1869. His early years were spent in the German public schools and gymnasia until at the age of twelve years he came with his family to America. He started his architectural training in the office of John Scott & Co., in Detroit, where he remained about a year, following which he entered the office of Mason & Rice. He was with them for the next fourteen years, during the latter part of which he had charge of the designing. While with Mason & Rice he received the American Architect traveling scholarship, which furnished him the welcome opportunity for a little less than one year's travel and study in Europe.

In 1895 Mr. Kahn with George W. Nettleton and A. B. Trowbridge, who were fellow draftsmen in Mason & Rice's office, formed a partnership under the name of Nettleton, Kahn & Trowbridge. Mr. Trowbridge severed his connection with his associates two years later to become Professor of Architecture at Cornell University, and shortly after Mr. Kahn was left to continue the business alone, owing to the death of Mr. Nettleton.

Mr. Kahn was among the first to perceive the importance of improving the design of factory and industrial buildings, and it is in this field that a great deal of his important work has been done. His efforts as seen in many of the largest automobile plants in this country and in the recently completed Detroit Athletic Club Building and the Hill Memorial Building at Ann Arbor, Mich., testify to his solutions of many difficult problems in plan and equipment and to the measure of success which has been accorded his work.

In a study of his work it will be noted that he has never deviated from the true purpose of an architect — he has always subordinated his love of what is beautiful to the utilitarian requirements of the structure, creating a building appropriate to its purpose and satisfying to the eye.

Mr. Kahn is not alone endowed with a very keen sense of what is best in art, in the broader meaning of the word, but has combined with this rare gift, in an unusual degree, commercial ability of a very high order. Even without this unusual combination of gifts his unswerving integrity, concentration of purpose, and industry would have carried him far towards the important position he now holds in his profession. — *M. R. B.*

J. MILTON DYER

IT IS always a matter for congratulation when personal magnetism has been fortunate enough to be held in check by good education. The first is almost sure to "get along," and when it lacks the restraint imposed by the second, we suffer by the presence of more or less permanent monuments to this quality. Milton Dyer would find work to do even if he had to make his brick without straws; but, for the peace of the community in which he lives, he has not had to do without straws. His education has been more two-sided than that of most architects. In addition to four years in the École des Beaux Arts he took a complete course in engineering and mechanics at the Case School of Applied Science before leaving this country.

He returned to Cleveland about seventeen years ago and startled the entire local profession by at once acquiring large and important commissions. Every one considered, and of course properly, that this was very unwise on the part of the owners; but, for some reason, the things were good and Dyer continued to proceed. Success is a somewhat complicated affair and depends upon a great many, and often opposed, characteristics; but it is customary to look for, and find, one particular thing and charge everything to that account.

Therefore it is our duty to determine this one predominant thing, even if it is only a part of the story. Genius has been called, among many other things, "an infinite capacity for taking pains," or, in other words, giving attention to detail. This is almost exactly not the case with Mr. Dyer. Please do not misunderstand. His capacity is to never lose sight of the main big feature of the problem and to not be confused by its details or allow them to get into a false perspective. The one most important thing that he has done for Cleveland — and it needed the lesson — is teaching scale. You may like or not like some individual building, but you will see that its scale is good. Milton Dyer is a good friend. It is often said of a man that he will do anything for any of his acquaintances and other similar characterizations which are true, but insufficient. My recollection of him, covering his professional life, is only one of good nature and tolerance in regard to almost everybody. This is a pleasant trait and one that can hardly be assumed or acquired, and I take pleasure in mentioning it as something more desirable than Mr. Dyer's well recognized success as an architect. — *A. G.*

BENNO JANSSEN

BENNO JANSSEN was born in St. Louis, March 12, 1874. He was educated in a private school and later entered the University of Kansas. After receiving his early architectural training in St. Louis he entered the Boston office of Shepley, Rutan & Coolidge, and later that of Parker & Thomas.

After grounding himself thoroughly in the practical side of the work, through office experience, he finished his artistic and theoretic education in Paris. During this period he availed himself of the opportunity to study the various styles of the countries adjacent to France. A short time after his return to this country he became associated with McClure & Spahr of Pittsburgh, and in 1907 entered into partnership with Franklin Abbott, under the firm name of Janssen & Abbott. Success followed this union.

Always admired by his associates in his student days for his remarkable ability of architectural expression, no less than for his personal charm, he, nevertheless, was misunderstood by many, due to the fact that he unconsciously was an exponent of the "New School," which teaches that the final result of an architectural attempt is the "building itself" and not the effect produced on paper, the latter being the vogue at that particular time. His rapidly made drawings were especially interesting to those who understood and left an indelible impression upon them. His seeking for truth of expression, the reasonable use of architectural forms, and for the understanding of the fundamental principles which govern architectural designs, portrayed only the dominating characteristics of the man as he is. Mr. Janssen's work shows not only individuality, but a comprehension of his problem, a forceful composition and yet an understanding of the value of detail and the selection of material. Add to this executive ability, tireless energy, and one has little reason not to understand his success. One has only to look at the Pittsburgh Athletic Club to appreciate the influence of this personality. For this firm to have the force to impress upon a committee the necessity and importance of producing a building of this character is no less an achievement than the design itself. The residences his firm has executed show not only individuality, but an indigenous quality which is so essential for a good, architectural result.

Although Mr. Janssen has devoted the larger part of his life to competitions, he, nevertheless, has shown the rare capacity to devote himself as energetically to the production of a beautifully finished building as to the production of the drawings which have won the commission.

One might assume from the foregoing that Mr. Janssen is some sort of a super-genius. He is not, however, but merely a talented young man, whose human quality can be vouched for by those who know him. — *W. D. C.*

AYMAR EMBURY II

WIDESPREAD recognition of Mr. Embury's ability has come early in his career. He was born June 15, 1880. He studied at the Drisler School, New York, and continued his education at Franklin College, Dresden, Germany. His architectural training did not begin until after his graduation from Princeton University in the class of 1900, followed by a Master's Degree in 1901.

As a newcomer into the architectural profession, Mr. Embury found the kindness and helpfulness of his fellow draftsmen invaluable. He is always ready to give them full credit and freely acknowledges that everything that he has learned of architecture was taught him while a draftsman by fellow draftsmen. His experience was gained in the office of George B. Post and successively in the offices of Cass Guilbert, Howells & Stokes, Palmer & Hornbostel, and Herbert D. Hale. It may be interesting to note that among his contemporaries during this period were E. F. Guilbert, Alfred M. Githens, James O. Bettelle, and the late T. R. Johnson.

Mr. Embury has become, as he jokingly expresses it, a forced specialist in country house work. He has devoted much sympathetic study to this type of architecture which is frequently scorned because of the inadequacy of its material returns, and has utilized the large number of problems which it offers to prove his ability and genius as a designer. He has fostered a most sincere *esprit de corps* in his office, which can be no stronger attested than by quoting from his introduction to a book in which his work has been published: "I look to them not only to carry out my schemes but to advise about them, and I receive no criticism so valuable, so constructive, and so trenchant as that given me by the men who work for me. From them I expect to receive sympathetic comprehension of my aims and frank and full expressions of opinion of the way I am trying to realize them. Artists themselves, they do not substitute flattery for criticism and, sincerely anxious that our joint work may be as creditable as possible, they never hesitate to point out defects or faults. There is no appreciation of successful work so pleasant as that of the men who have assisted towards its success."

Mr. Embury has contributed widely to the literature on architectural subjects. His books have been a great aid to the better appreciation by the layman of the architect's aim and purpose, and his articles in the professional journals are instructive and much appreciated. As a member of the New York Chapter of the American Institute of Architects and the Architectural League of New York he is an enthusiastic and active worker, always ready to wholeheartedly further their plans for development or entertainment. — *R. F. W.*

PLATE DESCRIPTION.

Apartment House, 405 Park Ave., New York, N. Y. Plates 61–63. This building is of steel skeleton construction, resting on concrete piers carried down to bed rock considerably below the level of the tracks of the New York Central Railroad which are located immediately outside the building line on Park avenue underground.

The enclosing walls are of brick, 12 and 16 inches thick, with 2-inch terra-cotta tile furring. The building is 144 feet high from the curb level to the top tier of beams.

There are twenty four apartments, the rental of the south and larger apartments ranging from $5,500 to $6,500, and the north apartments from $3,500 to $4,500 yearly.

The passenger elevators do not open on public halls, but connect directly with the private vestibules of each apartment. Each apartment is provided with refrigerators supplied with an ice coil from the refrigerating plant in the basement. Vacuum cleaners and interior telephone systems are also installed. All fireplaces are equipped with large flues for the burning of wood

The Rogers Tenements, West [illegible]h Street, New York, N. Y. Plates 64, 65. To the passerby in the street the façade presents a spirit of repose and comfort beyond that of the average apartment in the neighborhood. The term "model" is decidedly applicable to the arrangement of the rooms and the amount of light and air provided for each apartment when the size of the plot, 50 by 100 feet, is considered in comparison with the usual provision made in the average apartment house.

The total cost of the building averaged 32.3 cents per cubic foot. To keep down the cost and yet to erect the building fireproof throughout, it became necessary to omit all ornamentation of the façade, except that which was possible in the use of the structural material itself.

The street front, above a low base course of concrete finish, is built of a dark red wire cut brick, laid in dark mortar, with almost black headers in patterns. The window sills and the main roof coping are of cast concrete. All exposed faces of these concrete sections are of broken tile and crushed gravel, brushed with wire brushes.

The walls of the inner courts are faced with a light gray pressed brick. To further reflect the light, the side walls of the adjacent buildings were painted. The courts are much larger than required by the Building Code.

The connecting link between the two units of the building contains on the second floor a reading room or meeting place for the free use of all the tenants—a pleasant innovation to find in an apartment dwelling. The large windows and center skylight give ample sunshine.

Other features of interest to the tenants are the individual storage lockers in the well lighted basement, a storage room on the entrance floor for baby carriages, and playgrounds on the roof for the children. These are protected by high fences of heavy woven wire and are also separated from the clothes-drying yards.

Structurally, the building is modern in every respect and in keeping with the best work of its class in fireproof construction. Exterior walls above the basement are of brick and furred with 2-inch terra cotta blocks.

The floors are of reinforced concrete built in general by the low arch method and supported by steel beams. On this are bedded the wood sleepers, to which the finished floors of comb grained North Carolina pine are nailed. In the hallways and the bathrooms the floors are of tile.

Partitions around the halls and stairs throughout are of terra cotta blocks, and all other non-bearing partitions are of solid plaster, finishing 2 inches thick, built of light iron bars fastened at top and bottom to the concrete construction and covered with metal lath.

Each apartment is kept an independent unit, separated from the public hall by a kalamein iron door, jamb, and casing, and the fire hazard reduced to the minimum. The stairs are of pressed steel, finished with white marble treads, iron railing, and wood capping.

All hot water for the building is supplied from a large tank in the cellar to which is connected a garbage burner. This consumes all the garbage handled daily by the janitor and the one fire serves a double purpose.

Copper is used exclusively for exterior sheet metal work. The roofs are paved with vitrified promenade tile.

The heating plant consists of a low pressure, sectional boiler, with abundant radiation in each apartment.

Additions to House of Abram Garfield, Esq., Cleveland, Ohio. Plates 69, 70. The portion of the house illustrated shows chiefly the music room, which occupies an entire wing, the upper portion of which extends over a covered drive to provide space for an organ chamber and a gallery which are reached by a winding staircase located in a bay. The room is 25 feet wide, 42 feet long, and 16 feet high. The tracery through which the organ sound enters the room occupies one end and the organ console is located at the opposite end.

The woodwork of the room is oak. The mantel is limestone and the ceiling is of cast ornamental plaster. The predominant color of the room is blue, because of that color appearing frequently in the furnishings. The walls above the paneling are tan color, and most of the large pieces of furniture are in colors approaching tan. The restful effect of the room is due in great measure to a discriminating use of very pale tan and green glass in the leaded glass windows, which modify the daylight in a pleasing way, although the tones are so pale that they are hardly noticeable.

Two Houses on Woodlawn Avenue, Chicago, Ill. Plates 73, 74. These houses were designed together for location on narrow city lots. It was the aim of the architects to utilize the land to the fullest extent, and their solution makes the space at the rear the most desirable and important part. The service has been confined to a court between the houses with direct entrance from the front. The rooms which are used but a portion of the day, and which are least disturbed by the noises of the street, are placed at the front of the houses.

House of Hiram Walker, Esq., Walkerville, Ontario, Can. Plate 75. The exterior walls are built of a rough textured brick of mixed shades. The woodwork on the exterior is white oak stained to harmonize with the walls. The interior is finished on both floors in white enamel paint, and all the floors are oak with the exception of the bathrooms, kitchen, and laundry, which are tiled. The house is heated with hot water and is provided with thermostat heat control. A garbage incinerator is also provided. The cost was about 25 cents per cubic foot.

EDITORIAL COMMENT AND NOTES FOR THE MONTH

THE LICENSING OF ARCHITECTS.

IT IS required by statute that before practising their professions lawyers be admitted to the Bar, and that engineers, clergymen, and doctors should have received a degree. Architects can, however, practise at will, without having qualified for their work, excepting in their own estimation. Why has the profession been left unguarded to unqualified invaders? Has it inherent qualities of so high a character that it needs no protective barriers? Are the difficulties of its practice so great as to discourage any attempts to practise it by untrained persons? Does it owe any duties to the public to guide them in the choice of its practitioners? There are unscrupulous men and inefficient men in all professions, and a Nemesis of sorts always awaits them, though it sometimes takes a long time for them to receive their deserts; but in all cases, excepting that of the architect, at least some qualifications are demanded. Why are architects an exception? Possibly because an architect is primarily an artist, and art cannot be controlled by statute beneficially. Possibly because the architect is a business man, a promoter, and statutes that apply to such persons become active only when procedure is criminal. It may be that as with poets — it is not advisable to nip "mute, inglorious Miltons" in the bud. But taking it for granted that any coercive act requiring a certain amount of training may be inimical to a very occasional genius who might have succeeded if he had not been suppressed, cannot it be claimed that there might be requirements demanded which even a genius could overcome, and that the act of overcoming them might be of benefit to him? To eliminate bad elements need not endanger good ones. An act licensing architects need not be an antitoxin which might destroy the subject for whose welfare it is to be used; it may be merely an antiseptic preventing contagion. Another plausible claim can be made that an acknowledged stamp of qualification, if it is based upon so low a degree of merit as it must be in dealing with prospective and not actual practitioners, belittles the profession generally and reduces all to a lower level. This seems specious, especially as in every profession degrees of attainment are recognized by special indications of merit.

The qualifications necessary to practise a profession should be those which would imply criminal ignorance if unknown to the applicant. Afterwards, progress can be rewarded by honors, one of those honors being election to the American Institute of Architects. And, incidentally, the neglect to place the letters A. I. A. or F. A. I. A. after an architect's name, is not praiseworthy as modesty. These letters represent an honorable distinction, a reward of merit, and an indication to the public of the esteem in which the man is held by the members of his own profession, who are better fitted to judge of his qualifications than are any other people to whom this might be delegated.

But to return to the subject of the licensing of architects — the principal argument in opposition seems to be based upon the anticipation that men who deserve little will receive formal acceptance in the professional ranks, while at present they are outlaws; that they will be endowed with a mantle of respectability which they do not now possess. This would seem to depend entirely upon the requirements of the licensing act and the character of its administrators. At first the public would concern itself little about the matter; in time they would come to recognize the fact that advocacy of the licensing of architects by the architects would be an act of altruism, much more caused by a desire to protect the public from inefficiency than to clear the skirts of the profession. It would bring the outlaw within the law and make him subject to censure and expulsion, and therefore tend to make the profession unattractive to him. It would force him to overcome his limitations due to his neglect, and the standard of required attainment could be gradually increased if found desirable. It matters very little to the architect of acknowledged reputation that there are camp stragglers. It matters a good deal to the public whether they are pillaged by those individuals. The personnel of the licensing board naturally requires careful consideration; but as the duties of such a board would require but little time, for which there would be no monetary return, it would not be attractive to the professional politician. Even a bad government does not object to posing as a friend and protector of the people when it costs nothing to do so, and the appointees to the licensing board for architects would probably be men of ability. But even if they were not, the statute could be so drawn that it would be practically self-acting, and it very probably would be committed to the hands of the architects themselves.

W. H. C.

THE Hy-tex Church Competition was judged at Washington, May 10, by a jury selected from the officials of the American Institute of Architects. The members of the jury were: R. Clipston Sturgis, president; Thomas R. Kimball, vice-president; Burt L. Fenner, secretary; John Lawrence Mauran, treasurer; C. Grant La Farge, director.

The jury made the following awards, — First Prize: Maurice Feather, Watertown, Mass.; Second Prize: Frederick H. Kennedy, Boston, Mass.; Third Prize: Antonio di Nardo and Charles L. Bolton, Philadelphia; Fourth Prize: H. J. Voss and A. F. Law, Boston. Mentions: Robert Wesley Maust, Wyoming, N. J.; E. Donald Robb, Boston; Jerauld Dahler, New York; Davis, McGrath, and Kiessling, New York; Francis P. Smith and J. Herbert Gailey, Atlanta, Ga.; M. A. McClenahan, Salt Lake City, Utah.

THE BRICKBVILDER COLLECTION

EARLY AMERICAN ARCHITECTURAL DETAILS

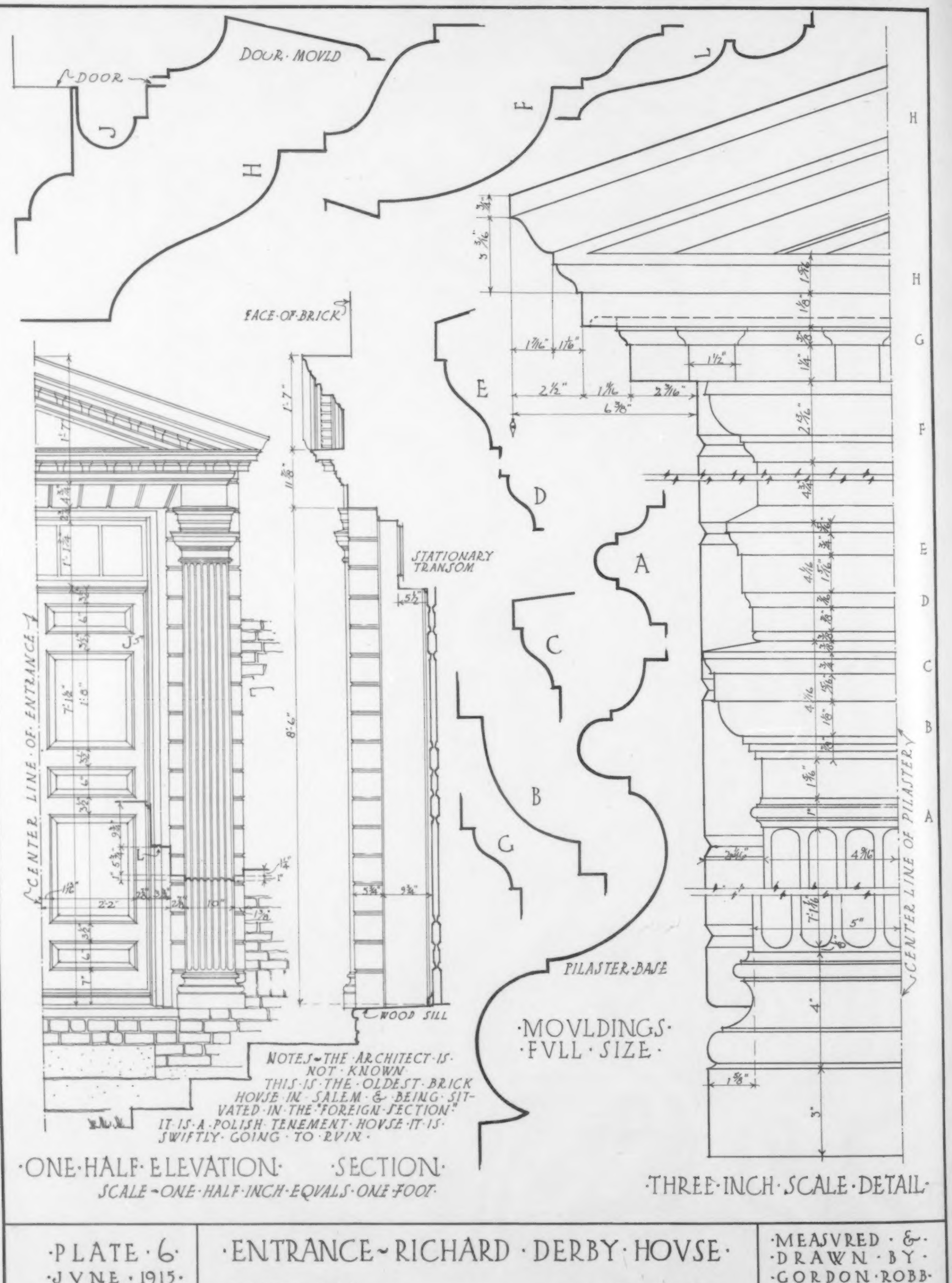
DOORWAY, RICHARD DERBY HOUSE, DERBY STREET, SALEM, MASS.
BUILT IN 1761 AND THE OLDEST BRICK HOUSE NOW STANDING IN SALEM

MEASURED AND DRAWN BY

GORDON ROBB & M. A. DYER

Plate Six

(over)



· PLATE · 6 · · JVNE · 1915 ·	· ENTRANCE ~ RICHARD · DERBY · HOVSE · · BVILT · IN · 1761 · SALEM · MASS ·	· MEASVRED · & · · DRAWN · BY · · GORDON · ROBB · · & · M · A · DYER ·

SMALL PALACE IN SALAMANCA, SPAIN
ERECTED IN THE XVIITH CENTURY